Teaching and Learning Methods in Medicine

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Springer

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ISBN 978-3-319-06849-7 ISBN 978-3-319-06850-3 (eBook)
DOI 10.1007/978-3-319-06850-3
Springer Cham Heidelberg New York Dordrecht London

Library of Congress Control Number: 2014948192

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Dedicated to our families and the memory of our parents.

The Knowledge

'Its head is humility, its eye is freedom from envy, its ear is understanding, its tongue is truth, its memory is research, its heart is good intention, its intellect is gnosis of objects and matters, its hand is compassion, its foot is visiting the learned, its resolution is integrity, its wisdom is piety, its abode is salvation, its helmsman is well being, its mount is loyalty, its weapon is softness of speech, its sword is satisfaction, its bow is tolerance, its army is debate with scholars, its wealth is mannerism, its stock is abstinence from sins, its provision for journey is virtue, its drink is gentleness and politeness, its guide is divine, its companion is love of the elect… and without skills it is like a bow without an arrow'.

Ali Ibne Abi Talib. (596–661 AD)

Preface

Knowledge was best defined by the Philosopher-Saint-Soldier, Ali Ibne Abi Talib (596–661 AD), as mentioned on the previous page.

It was also defined by that ageless master who lived in Ancient Greece. His name was Plato. He called it 'virtue'. One cannot better this definition, as the whole philosophy of education revolves around the fulcrum of the welfare of mankind.

The time tested theories of good and its perpetual battle with evil are well documented in the annals of human history. One is reminded of a tale of a Greek god called Prometheus, who was punished by his cohorts for throwing down an ember from the heavens into the abyss of ignorance in the Earthly abode of mankind. An ember, the first source of knowledge, sparked evolution of the human mind. This tiny ember, though inconspicuous, brought about a revolution eventually challenging the authority of the mighty and the resourceful.

Education is either formal or informal. Informal education begins as one enters this world. Each living being is granted four basic instincts by nature: they are: hunger, security, curiosity, and companionship.

So as the baby is born he wants to suckle to quench his hunger and thirst. That struggle to fulfil his bodily needs perseveres throughout life. And that is the very basic animal instinct.

Security is what urges a baby to seek protection in its mother's lap and this animal instinct is seen throughout the animal kingdom, varying in intensity and needs. Freud, the illustrious psychologist, gave huge importance to the instincts of hunger and desire, and indeed the need for security, massively importance in his numerous studies and in his own particular philosophical style.

The third instinct that all animals, including Homo sapiens, possess is curiosity, which is an immensely important attribute to possess. The moment a baby is born, he begins to explore his surroundings, his habitat, his location, his surroundings, his requirements, etc. employing the natural senses of vision, hearing, smell and taste. Obviously the brain of a newborn is like a clean slate. So each experience is recorded and each further exposure to anything new is duly matched with the recorded experience and stored in the deep layers of the cerebral cortex, in the gyri and sulci dealing with memory and recall.

The well-known facial expression of a baby displaying so-called innocence, surprise, fear, anxiety and simple curiosity, displays the underlying lack of knowledge. As the baby grows, the learning process changes the expression and attitude from not knowing a thing to knowing it all. Even the fundamental startle reflex so typical of the fear and flight phenomenon seen in the early days gradually disappears and a confident approach takes over.

This process of learning by exploring continues throughout life, and is best described as informal education.

The basic difference between the animal kingdom and mankind in terms of instinctive evolution is best described by Bergson. He defines it as a distinctive attribute of reasoning and intellect possessed by mankind but not by the animal world. So, although offspring of an animal and of a human being may behave identically in the face of exposure to danger, the latter would gradually learn to overcome and counteract that danger, while the former always seeks an exit through escape, unless of course you are talking about a predator, which is born to kill or maim; sadly enough, even some human beings have the same tendency, often called animal instinct.

Finally, the instinct of companionship is second nature to all animals. In the case of mankind, the desire to make friends depends and nurtures with upbringing and the environment afforded to him in early years. If the growing environment is healthy, one will obviously seek, develop and cultivate human relationship and bonds with good people. If otherwise, one may become part of an evil gang. So, although the desire for cultivating companionship is natural in the entire animal kingdom, unlike the rest, mankind has the option of harnessing the best through choice, this playing a significant role in the development of personality. As the wise man says, you cannot choose your lineage but you can certainly choose your friends.

Savants advise us that informal education begins at mother's knee and ends in the grave. It is certainly more valuable in the development, cultivation and modulation of a personality. Many renowned philosophers, scientists and scholars did not have an ideal formal education, but had personalities like a sponge, soaking up every bit of learning experience from the wise for the welfare of the unwise and to save themselves from folly as they moved on with their lives.

The second component is obviously formal education. It begins at home when a child is taught the first word, or a sentence or a lesson, and continues throughout adult life. The process of schooling followed by either a university or an apprenticeship to acquire suitable skills to live from is what is described as a formal education. Those who endeavour and are fortunate enough to go through the entire learning process of university, etc. usually do much better in life than others. This is why the old dictum that education is only for the sake of learning may not always be true. Yes, in the olden days, when scholars were hired, employed or given stipends for their scholarly pursuits are gone for ever. Now, the fundamental application of the process of education is to enable one to earn a living, which is regrettably a sad situation but nevertheless true.

A fine definition of education describes it as 'a process that brings about a visible, palpable, tangible change in a human being'. It is well received by educationists. The process of education is a long and demanding activity. It may indeed be so, but at the end of a long and tortuous journey, the satisfaction gained is simply indescribable. People immersed in knowledge live a different life to most others. They live in a celestial world, where nothing material matters to them. They live a life of peace and tranquillity, a life full of joy and happiness, a life full of glory and inner satisfaction. Some pundits have rightly labeled it as Nirvana. However, not all can reach this stage; not all can achieve those high altars. The fortunate few who do become a beacon of light for the rest of the world.

Medicine is an ageless profession. Magic and sorcery were common practices in China, and one might say that dragons and the use of Hippo corn, etc. are still cardinal features of the Chinese medicine witnessed in most China towns. However, the famous Chinese practices of acupuncture and tai chi have stood the test of time and are now taught through instructional sessions in the modern world as, indeed, must have been the norm in olden days.

The earliest recorded evidence of medical education can be traced back to prehistoric days. This region has been described in the history books as Mesopotamia. It is also called the cradle of human civilisation. The mighty Sahara of Nejd-o-Hejaz borders this region on the northern side with Asia Minor hills standing guard in the neighbourhood. The fertile lands of the ancient cities of Hilla, Kifl and more famous Babylon lie in the valleys of two mighty rivers, namely Tigris and Euphrates. Not more than 100 m from Euphrates rests the antiquated ruins of Babylon, where once stood the hanging gardens, duly watered by the prisoners of Nebuchadnezzar. The mighty kingdoms of Summer and Akhad flourished in these regions for more than a couple of millennia. The city of Ur was the very pinnacle of human endeavour all those years ago, now frozen under the avalanches of history. Architectural excavations in this region have found small copper knives, considered to be surgical instruments. Many clay tablets carrying medical writings were also discovered. The archaeologist guide and a physician by profession, who is a professor of epidemiology in the University of Babylon, told this author (SZ), that the clay tablets were indestructible as the natural clay of Babylon contained substantial quantities of oil and lead, giving them unprecedented strength. Unlike the papyrus used by the Pharaonic Egyptians, the Babylonian tablets are more lasting. A seal of a Babylonian medical man dated about 2300 BC is still present in the Louvre museum. Similarly, Summerian seals are also present in the Welcome museum, not far from Euston train station in London.

So the formal medical profession existed in the early Sumerian and Babylonian civilisations. These men of wisdom or Hikma must have transferred their knowledge and skills through long apprenticeship of the pupils. Not just that but the most essential component of the medical profession, i.e. ethics, traces its origin to the first documented evidence of the principles of moral conduct.

Hammurabi (1770 BC approx.) gave a code of conduct, now preserved on a clay tablet in the famous Louvre museum. It defines the fundamental principles of ethics, giving specific directions regarding the benefit that a physician must provide to a patient, duly complemented with the instructions of avoiding harm to a patient, who if harmed must be duly compensated by an equal and matching punishments such as an eye for an eye, a limb for a limb, etc.

The illustrious historian Herodotus described in his writing in about 430 BC that Babylon had many physicians and even a common citizen took care to notify any disease, he developed or knew about in the community in order to get some advice. The ancient cuneiform clay tablets bear pictures of the liver, as do the clay models, showing the deep anatomical knowledge of these ancient priestly physicians.

One presumes that men of knowledge were men of importance and possibly belonged to the elite class of priests. As has been customary in religious circles since time immemorial, the method of transference of knowledge was a long and protracted association between the priest or *guru* and the pupil or *chela*.

Ancient Egypt had many priestly physicians. Their main was to serve their masters, but also the poor and the needy. Ebers papyrus is the source of information on ancient Egyptian medicine. Strange concepts prevailed in the profession, such as the heart being the principal organ controlling the brain. The importance of the heart is also noted down in many divine scriptures. For instance Quran, the final testament, describes *Qalb, Lub'ab* and *Fua'ad* as the seat of emotions, intellect and reasoning. It does not, once, mention the role of the mind in this respect per se.

The art of healing was taught through practical demonstration and application of technology in a patient. Description of management of a dislocated jaw is a good example to quote (pp 26, *A history of medicine*.). The teacher advises his pupils as follows: "if you examine a man having a dislocation of his mandible, should you find his mouth open, and his mouth cannot close for him, you should put your two thumbs upon the ends of the two ramii of the mandible inside his mouth and your fingers under his chain and you should cause them to fall back so that they rest in their places". How apt! Those of us who have had to deal with such situations in practical life can hardly improve upon this mandate, given to the ancient Egyptian masters so very long ago!

Pathology was certainly the main field of research and education in ancient Egypt. The most obvious example of the discoveries of those masters is still visible across the world in the museums which display the mummies of ancient Egyptians. During the process of mummification, the post mortem was carried out by the pathologists, technicians and their disciples. First-hand knowledge of the bodily organs was taught through the process of hands-on training, including the employment of alchemy using such items as myrrh, spices, cassia and other preservatives.

The formal teaching of medicine as a profession may be witnessed in the ancient Egyptian archives.

Douglas Gurthrie in his book 'A history of Medicine' wrote: 'it may be said that the Babylonians and Egyptians practiced magic, and sorcery was a common practice in China. The Hebrews laid great stress on personal and social hygiene, and were the founders of epidemiology and public health. The Hindus contributed materially to the art of surgery, while the Chinese were the originators of many discoveries in medicine which came into full action at later dates'.

All one can add to this wonderful summary is that the physicians and surgeons of these great nations transferred their knowledge and skills to their wards, pupils and chelas through long apprenticeships, and even more prolonged personal guidance and tutorship.

The Greeks, as in many other scholarly fields, seem to have given the concept of one to one teaching in medicine. Galen, alias Hakim Jalinoos, is the father of modern medicine. His contribution is immense. Even today we teach about the Galen's vein.

Pythagoras (580–498 BC) was a sophist. Like Thales, he was one of the famous wandering philosopher-teachers of ancient Greece. Every student of science must be familiar with his theorem in geometry. He was an eccentric genius, who believed in propagation of education at a fee. He appears to be the founding father of the discovery of numbers. We know well enough that no medical knowledge is complete without numbers. How can one conduct research in modern medicine without knowing reasonably well about figures, numbers and statistics? He and his disciples founded a school which exercises a huge influence upon medicine, introducing the doctrine of critical thinking, synthesis of facts and figures and analysis to arrive at a conclusion. In fact, he applied his mathematical genius to medical knowledge, not just to gain more but to propagate more in various fields of discoveries and research. Philosophically speaking, he was one of the first few to believe in the transcendence of the soul, much like a later scholar called Mullah Sadra.

It is said that Hippocrates benefitted from the Pythagorean principle called the 'doctrine of numbers', employing it in the concept of critical time period in an illness and the highly influential concept of four humours and elements, which are still prevalent in Eastern cultures in Tibb and Ayurvedic.

One of the disciples of Pythagoras, by the name of Alcmaeon, dissected animals and taught the principles of learning through dissection to his pupils. This man was not as famous as his teacher, but was perhaps equally knowledgeable in sciences. His concept of the brain and not the heart being the focus of human feelings, senses, sensuality and intellect is not far from present day notion.

Aristotle was a botanist, zoologist, mathematician and philosopher par excellence. His contribution to medical education is formidable. He was a believer of the four humour theory. It became a popular subject in early Arab and Persian medical teaching and practice. They practiced an empirical and enigmatic kind of medicine, regulated by a strict code but not inspired by a spirit of enquiry into the causes of disease. The Hebrews laid great stress on personal and social hygiene, and were the founders of epidemiology and public health. The Hindus contributed materially to the art of surgery, while the Chinese were the originators of many discoveries in medicine which came to fruition later.

Teaching and learning require a lifelong commitment. Formal education may end with schooling, a professional college, or after acquiring a degree from a higher seat of learning, but not a day passes by in a physician's life that he does not learn something new. One statesman quite rightly said that three professions never retire, namely, the artist, the politician and the physician. Even after reaching the age of superannuation, a physician can be highly productive to his neighbourhood, his family and his community by sharing his knowledge and experience with his fellow human beings.

Education is meant to improve the life of an individual but professional education such as medicine is helpful in improving the life and its quality of the public at large. In other words, the very purpose of education, i.e. reformation, is best achieved through medical education. Between both of us, we have learnt and taught for several decades. The experience thus gained must be shared, or it loses its value.

This book is our humble effort to share our experience, gained through long years of association with teaching.

We wish to acknowledge the help given by Sally and Nicole of the City Hospital Birmingham Library in literature searches, the Medical Education Department and the Vice Chancellor of Dow University of Health Sciences, Karachi, and the competent authorities of ERAS and AUB for their data and support. Thanks are also due to Mohsin Reza Hyderi of Beheshti University, Iran for the opening quote on Knowledge by Ali Ibne Abi Talib.

Finally, a note of very deep appreciation to Springer, and especially Sylvia Freyberg, our clinical editor, for perpetual support.

A History of Medicine. Doughlas Guthrie 1960. Pub. Thomas Nelson and Sons Ltd. London, Ed, Paris, Melbourne, Toronto, NY.

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1 Knowledge: Theories and Principles of Learning

Education has evolved over the centuries. Teaching was monopolized by the men of religious authority, the clergy, the monks and the monasteries. Indeed, the church was against the promotion of knowledge and skills to a common citizen until the Reformation. Men of pen and writing skills, or free thinkers, were condemned to death, burnt alive at the stake, or simply locked away in dark abysmal dungeons.

This was one of the reasons why many a great thinker, philosopher and scientist became rebellious, anti-establishment, anti-Church, even anti-God. The authority of establishment, the Church and the clergy, gradually eroded away and education found its way into the open – gardens, parks and courtyards.

One presumes that men of knowledge were men of importance and possibly belonged to the elite class of priests. As has been customary in religious circles since time immemorial, the method of transference of knowledge was a long and protracted association between the priest, i.e. the *guru*, and the pupil, i.e. the *chela*.

Ancient Egypt had many priestly physicians, whose main job was to serve their masters, but also the poor and the needy. The Ebers Papyrus is the source of information about ancient Egyptian medicine. Strange concepts prevailed in the profession, such as the heart being the principal organ controlling the brain, the latter having little importance.

Teaching the art of healing was conducted through practical demonstration and application of the "technology" in a living patient. The description of management of a dislocated jaw is a good example to quote. The teacher advises his pupils as follows: "If you examine a man having a dislocation of his mandible, should you find his mouth open, and his mouth cannot close for him, you should put your two thumbs upon the ends of the two ramii of the mandible inside his mouth and your fingers under his chin and you should cause them to fall back so that they rest in their places" (*p 26*, *A History of Medicine*). How apt! Those of us who have had to deal with such situations in practical life can hardly improve upon this mandate, given by the ancient Egyptian masters so very long ago!

The universities came into formal existence in the early fifteenth-century. Many universities such as Cambridge, Oxford and Harvard have been beacons of light for

S. Zaidi, M. Nasir, *Teaching and Learning Methods in Medicine*,
DOI 10.1007/978-3-319-06850-3_1

several centuries, and continue to spread knowledge more profusely now than ever before.

It is rightly said that the first millennium was the millennium of philosophers, the second of religious faiths and the present millennium is all about information technology, which means knowledge.

The underlying principles of learning are:

1. Instinctive
2. Instructional
3. Observational
4. Practical

The process of education has moved forwards in leaps and bounds with the help of the latest computer technology and its various forms, such as tablet, smartphones, etc. All kinds of boundaries, barriers and limitations have been destroyed by computer technology. If only men of bygone days, who strived so hard to propagate education, could travel through time to see the revolution!

1.1 Salient Features of the Principles of Learning

1. Instinctive

   Every human being is born with four instinctive needs: Hunger, Curiosity, Security and Company.

   The moment a baby is born he needs food. He either searches to find his mother's breast himself, is helped to find the source by the mother or is fed artificially. Hunger is not limited just to food. As adulthood arrives, emotional desires and sexual hunger urges take over. Then there is the hunger to be rich, or famous or both. That hunger leads to a person becoming greedy, jealous, and even tyrannical. Education is one way of toning down those evil attributes, even eliminating them.

   Curiosity is instinctive. For instance, look how we reach out to grab a burning coal or try and catch a flame as a baby; or look, smell, feel and explore all new and shiny items we encounter in our growing lives. Curiosity is what allows us to explore new worlds, touch the stars, explore space, and experiment with the Large Hadron Collider to prove the existence of the God particle. Curiosity is the founding brick of man's endeavour to learn. It is an instinct which stays with him until his dying day.

   Security is a natural need, as mankind is so weak, so vulnerable and so susceptible to trauma that he develops his own ways of finding security and safety. The cave man learnt to secure himself by living in groups, hunting and gathering, and escaping and avoiding danger when it came or it was foreseen. So in the constant need for security he has had to learn fast, and indeed continues such learning all his life.

Finally, companionship. As is rightly said, man is a social animal. From the day a baby is born till the day he dies he searches for company. If he can't find one of his own kind, he finds it in the shape of a pet. To find a suitable company he looks, searches, explores and experiments with different people. If he finds someone, he lives happily ever after – if not, he just lives on. This process of looking for matching company is important – as they say, one is judged by the company one keeps.

2. Instructional
This is the time honoured and litmus tested method of teaching and learning. A baby is instructed by his mother every step of the way; a school teacher instruct at nursery and then throughout primary school, not only the syllabus but also the ways to cross the road, ride a bus, solve a puzzle, indeed learn the ropes. Then comes university or apprenticeship in a job. An instructor, teacher, facilitator, guide is always there to teach, instruct, train, improve, supervise, test and improve the level of education of the pupil. The process is eternal and transcendental in a manner of speaking, as, in turn the pupil takes over the role of instructor, and the process of transference of knowledge continues ad infinitum. Life in education is like a relay race – the baton is passed from one generation to the next.
3. Observational
A baby observes his parents or siblings or peers to absorb information, acquires due knowledge and applies it in time. As pupils, we observe our teachers perform an experiment in a chemistry laboratory, and learn. Likewise, in the medical profession, we learn the art and science of medicine through observation and "osmosis", absorbing the relevant pieces of knowledge and skills to become a professionally competent physician. We begin learning early in life and, as we progress in our profession, the data gathered in our cerebral cortex over the years tend to spill over; thus we transfer our knowledge and skills.
4. Practical
All the information gathered through instinctive or observational paths must be complimented with practical application, otherwise it is meaningless and useless. As the great soldier-philosopher-saint Ali Ibne Abi Talib said 'Knowledge without matching skills is akin to a bow without an arrow' or, in the contemporary world, a gun without a bullet.

Practicals form the inseparable component of a learning process. Laboratories have always been the regular features of medical curricula. The theoretical knowledge acquired in a classroom is duly applied in laboratories to observe the practical application of theory. As the panorama of medical education changes with time, we have now moved on in the practical fields. Instead of the old fashioned black rotating drums and pithed frogs on a wooden block for physiological experiments, fresh looking, nicely decorated modem and sleek skilled laboratories have taken over, where the students can practice physiology on themselves, mannequins and simulated or structured subjects.

There is no doubt that the future of a young medical student depends greatly on the faculty and the curriculum. Therefore to say that medical education is a serious business and an undertaking of immense importance is an understatement. It is a huge responsibility, to say the least. The health care of a community depends upon the physician serving them, and this, in turn, depends upon the institution which produced him.

The practices adopted by a medical school depend upon the philosophy and the principles of learning observed and applied by the faculty.

Some educationists emphasise the difference between the two elements of education, namely Teaching and Learning.

They inform us that Teaching is an activity or an exercise performed by a teacher, and Learning is the mechanism resulting in a final product in the shape and form of remembering certain facts and acquiring certain behaviour to apply that knowledge. So, in other words, teaching is a means to an end, the end being the process called learning. This is one reason why both students' guidebooks and tutors' guidelines specifically focus on the learning objectives.

The famous educationist Malcolm Knowles identified the following six fundamental factors of adult learning Fry et al. (1999). We have attempted to harness these principles and translate them into the context of medical education.

Goal orientation
Self-directed and autonomous
Experiences and models in memory from the past
Ready to learn on demand and need
Practical and problem solving attitude
Incentives, personal benefits and rewards for work as motivating forces

Teaching and learning are ageless attributes Race and Brown (1998). No doubt theoreticians and thinkers outline the parameters, indeed trim and tailor them, to suit contemporary times, but they remain free of all forms of bondage.

The ability to teach is an art bestowed by nature only on some. There may be many masters of subjects who are oracles of knowledge in their own right, but who may not be able to transfer this knowledge effectively and successfully to anyone.

There are many maestros who can write and impart knowledge to those who want to learn, and there are others who can neither write nor speak coherently.

However, there are many teachers who can make the most intricate, most complex issues seem not just simple but also interesting and enjoyable. As technology has advanced, most of us have used them in the form of PowerPoint, or before that acetate sheets and overhead projectors, etc. Yet, traditional ways of using the backboard continues to be followed by many. Of course, now we are using interactive white boards instead, and continue to benefit from this.

Didactic lectures have stood the test of time, but are now under question and critique, as we shall discuss later on Ramsden (1992). Many teachers in the past were in the habit of dictating notes, some from their own studentship. They would dictate each and every word, and even the punctuation! They would then expect the students to rote memorise them and regurgitate the same during the exams. This was a common practice in the Indo-Pak subcontinent. Part of the reason claimed by such teachers to justify their practice was that many students came from a schooling background where English may not have been the primary medium of instruction, thus finding medical textbooks in English hard to understand.

This argument may be justifiable in some cases but not all. The practice, however, continues to flourish even now, raising many questions such as the process being teacher-centred rather than student-centred, a major point of contention and argument against didactic lectures.

There is a major difference between adult and child teaching and the learning process. Not many people know this but it is a fact. At an international seminar held in Feb 2013, the author (SZ) gave a talk on the theories and principles of learning to an august gathering of senior faculty, only to be amazed that many had no knowledge of the famous pedagogal and andragogal theories of education.

This brings into focus the contribution of an eminent educationist, Malcolm Knowles. He revolutionised the principles of learning and teaching through his description of the pedagogal and andragogal theories.

His description is considered to be a gold standard in educational strategies.

Regarding the pedagogal or the Traditional Principle, he has identified five major focal points, as discussed below.

1. Learner's self concept
   Knowles believes that each individual has a capacity to learn inherently, and he is dependent upon the teacher to direct him, guide him and teach him. In other words, it is solely the responsibility of the teacher to take all relevant decisions for the process of educating a person. He determines what, how and how much is to be learnt, duly assessing over time whether the student has indeed leaned as specified or not. Obviously the whole exercise makes the learner a passive, often submissive, totally dependent character. It is a different matter whether or not such dependence is useful, productive and conducive to human development – this is left to the educationists to judge for themselves.

   We believe this practice to be acceptable for a toddler, even a young adult, but may not be useful in the field of medical education, where biological sciences are evolving each day and facts and figures change by the hour. So what the teacher may have taught may become outdated sooner than later. Furthermore, the human mind becomes bogged down in the dictates of others rather than think independently.
2. The role of a learner's experience
   Knowles believes that most learners join the learning activity as novices, i.e. without much experience to harness in the process of further learning. Therefore they have to rely upon the experience, knowhow and teaching aids employed in the process. Thus a learner becomes totally dependent on the teacher and his ways of imparting education.

   As mentioned before, there are some traditional teachers who would dictate notes, others would give copies of their lectures and some clever ones even publish their lecture notes for the benefit of the students. Blackboards, overhead projectors and audiovisual aids are also teacher dependent and prepared by the teacher to meet certain objectives set aside at the beginning of the course. In fact, many a teacher would prefer a particular textbook, even condemning other equally reliable books, or write a book of their own, expecting every student to cram from it for the exams. Regrettably, the fate of such lecture notes and purpose-built textbooks remains seasonal, with limited use. Once the students have moved on, such items are hastily discarded. So, in other words, these teaching techniques are temporary and ad hoc in nature.

3. Readiness to learn

   Knowles believes that in the pedagogal way of teaching, the young human mind prepares to learn as told and absorb information as given by the teacher, the obvious reason for a student to learn being the motivation to move up to a higher grade.

   Such a pre-determined and targeted approach may be good for progress in school and to get higher scores, or diplomas, but it appears to be a short-term policy as the target is specific and embedded with certain objectives. Surely such a practice will not be conducive to deep thinking and long term use. However, we have all gone through the process and memorised tables in schools, the theorem of Pythagoras, and perhaps the theories of hearing, etc. in the medical schools. They were meant to help us pass our exams and to progress. The teacher taught us through lectures, explained things on the blackboard, and we crammed them, only to forget them over time. So the whole process was based upon a predetermined almost conditioned phenomenon to achieve certain goals. Such a goal targeted practice based upon the dictation of a teacher is arguably not the best form of teaching after a certain age. At school, where the young mind is unable to decide or determine what needs to be learnt, such a process is quite justifiable, akin to the training to cross the road, when the mother teaches a child to look right, look left, look right again then swiftly cross the road. However, if you tell this to a grown up person, with his senses and competent control the whole practice would seem silly! So when Knowles says that this principle of learning in pedagogy, namely readiness to learn, is largely a function of age, he is absolutely right.

4. Orientation to learning

   Knowles believes that the teacher decides and determines the core content of the syllabus or a particular subject, taught to the student through a predetermined course of action. In other words, ‘prescribed subject matter’ is transferred to the student through a process of what he describes as ‘subject-centred orientation’. The curriculum designers therefore design a curriculum, and syllabus based upon the principle of teaching a specific subject covering a specified matter.

   This practice raises many questions. The first basic question is how do you determine what subject is best suited for a certain age group? Furthermore, what subjects should be included and what excluded from the core content. Obviously the major stakeholder in the exercise, i.e. the student, has no say in the matter. It is a paternalistic approach, which we have seen in many professions, particularly in medicine, until recently. The doctor knew it all, so it was left to him to decide the fate of the patient, good, bad or indifferent. If the doctor was seasoned and experienced as well as ethical, he could make an honest decision, but what if he turned out to be a Dr. Shipley?

Likewise, if the teacher was honest, ethical, prudent enough and seasoned, he could take an honest approach in deciding what should or should not be included in the core content of the subject. However, what if he was unethical or had a special dislike for a certain colleague or teacher who may have failed him in his career, etc.

Professional jealousies, envies, dislikes even personal hatred are so very common in illustrious academic circles that one feels ashamed even to talk about it. One particular teacher in physiology in London, a long time ago, hated Samson Wright to the core of his heart. Thus he made sure in his introductory lecture, after rebuking his old teacher and time honoured Prof Wright as much as he could, no one dared even mention his book let alone use it in his studies. This is nothing but a personal vendetta, which is not uncommon, depriving many students of wider exposure, indeed making them myopic in their approach. Regrettably, higher seats of learning in medicine are full of personal jealousies, likes and dislikes, even vengeance. It is sad but true!

5. Motivation to learn

Knowles believes that a pedagogal method motivates the students to learn on account of external pressure, mainly, of course, from parents, but also peer pressure or a teacher. Thus they want to learn with a view to achieve a certain objective or a certain goal, such as passing the exam or getting a higher grade. The worst fear, i.e. failure to pass the exam, could drive a student to the limit, to memorize, and recall even beyond his capacity, thus stressing him out unduly and unnecessarily.

At a famous medical college, now a globally renowned university, a few years ago couple of students committed suicide, which was alarming to say the least. It was thoroughly investigated and the cause was determined as sheer stress and peer pressure.

This particular factor deeply affects those students who may not have had an excellent primary education, and who have to compete with others with excellent primary education, in a medical school or college. Such a traumatic experience could literally demolish a young person who is completely blameless. Because he was bright and qualified in the entrance test, achieving certain marks or grades, he stand on a par with others, but because of the reasons mentioned above, he may indeed suffer, even succumb. Knowles is absolutely spot on when he determines that motivation to learn in the pedagogal way of teaching is deeply influenced by many external factors. You may be able to justify some of them in creating age groups, but not all.

To criticise and condemn the pedagogal ways with a view to rejecting it is wrong. It has stood the test of time and continues to do so. Obviously, therefore, there must be some good in this methodology. One positive plus point, of course, is the element of economy. Lectures are economical and fairly time saving. Furthermore, if a lecturer knows the art of teaching, he can really impact upon the audience and leave indelible impressions on their minds. Surely we have had more than one such teacher in our lives who we can never forget because they were simply the best. They were excellent speakers, full of knowledge and knew the art of transferring their knowledge to others. Likewise, we can also recall many a teacher who was simply hopeless, lacking the content as well as the art of communication.

Pedagogal ways of teaching are still common in many medical schools. One major reason for their success is the ease with which a large volume of knowledge can be transferred to many audiences in a short period of time. Besides, many medical schools accept very young students, who may not have been exposed to any other way of learning except didactic lectures, spoon feeding and rote memorising. Thus, if exposed to innovative ways of andragogal teaching they might become confused, lose their ways and fail to achieve their desired goals.

As to traditional teachers, suffice it to say that many subject specialists prefer to continue teaching the way they were taught and have practiced since early on in their own careers. The general argument put forward by these folks is simple and quite logical. They claim with considerable evidence-based support that, if the system has worked for generations (and that goes far beyond Mr Flaxner), why should one change.

They also argue that the new methods have to prove their credibility and validity over time. If they withstand the test and pressures of time, one may adopt them, and if they fail, then what would be the fate of those students who had undergone training through the change? Change is indeed quite difficult to accept.

Now let us discuss the Knowles' andragogal principles of learning in the context of medical education.

1. The concept of the learner
   Knowles describes an adult as 'the one who has arrived at a self-concept of being responsible for one's own life, of being self-directing', so Knowles believes that an adult learner is self-directing. So if a process of learning involves a learner in the process per se, he feels himself responsible and learns actively. On the other hand, if an adult is forced to act in a given fashion, or learn through a predetermined design, a feeling of resentment, even disapproval, may develop inherently, subconsciously and overtly. Age is an important factor in matters of learning. As a child, our brains resembled a sponge, observing everything with a curiosity, touching, feeling, and exploring it, and finally absorbing it all for retention in the memory centre of our cortex. The memorisation capacity of a neonate is far more than a toddler and that of a young man or woman entering a university. This may be significantly more than that of his teacher, but markedly less than a few years ago. It is not rocket science. We know that neurogenic decay, and indeed the whole process of apoptosis in each cell of our body, is an ongoing process. It can neither be stopped nor the damage repaired – not yet anyway. However, Eugenics might perform some miracles in future decades – who knows!

The gradual decline in the capability to remember everything as we grow old is duly compensated by an equally worthy, if not more valuable, attribute called experience. The Summative potential of knowledge and experience leads to an even higher attribute, usually age dependent. It is called ‘wisdom’. Nothing can match let alone supersede this fine attribute which some possess and others lack. It is the attribute of wisdom which enables a man to determine what is eventually good and what could be potentially bad not just for himself, but, more importantly, for his wards, in this case the students. And this is why the young duly respect their elders, and students their teachers.

Now this adds another dimension to the whole debate. If a teacher has gained experience, and his knowledge acquired through his hardships ultimately transforms him into a wise man, his responsibility becomes manifold. Now, apart from the fact that he is older, and a respected teacher, he is also a wise man. Therefore it becomes manifestly important that he must guide his juniors, wards and students onto the right path, a path which should ensure success in life.

Knowles’ andragogal principle of self assurance, self responsibility and independent thinking is so fundamental in medical education that it can hardly be argued against. To achieve a certain objective or goal in life, an adult must be able to determine what, how and when he wishes to learn. The practical application of this principle can be seen in day to day life in simple matters such as driving to the university or taking a bus as against a child who would obviously have a decision made for him by his parents..

One thing particularly relevant in andragogy is the principle of self-directed learning. It is a natural process of ageing. Adults develop this trait naturally, as they have many hats to wear in their lives. They are husbands or wives or parents or heads of institutions or managers, doctors, nurses, etc. Therefore, they develop a trait of learning as they move along, acquiring fresh knowledge and applying it in day to day life. It has been observed by many educationists that, despite the attribute of self-directed learning being their second habit, the moment these adults enter a classroom, a workshop or a training course they become totally dependent on the instructor and adopt a pedagogal approach. This trait is probably the result of a natural process of evolution, as we tend to become defensive in an alien environment, choosing to pass on the responsibility and decision making to someone else. Furthermore, because of our long association with schooling, and universities, etc., as adults we also tend to look up to an authoritative figure, taking it for granted that he or she is more knowledgeable. That may indeed be true, as we have all attended workshops in different fields such anger management, conflict resolution, managed health care, even basic topics like blood transfusion. And more often than not, we find the instructor be an expert in that particular field, talking with authority, and expertise.

The tendency to become a child again is universal. However, as teaching strategies and the learning environment are changing by the day, things are becoming clearer and adults are learning to behave more like adults. This mean that the disciplinary, old fashioned, time managed, environment controlled school environment which had also filtered into the universities, is becoming more informal, more relaxed, less authoritative and certainly more conducive to learning for life.

The author (SZ) recalls one particular teacher in medical college who was called Mr Hitler, as he would not tolerate the slightest indiscipline in the class. He was a good man and a fine teacher, but he believed in installing total discipline in the students, who were in the age range of 23–25. One particular day, a student tried to escape one of his long lingering lectures. By sheer misfortune, he slipped and fell down on the wooden floor, making a noise he would probably never forget for the rest of his life. The classroom went deadly quiet as the famous teacher viewed the scene with his unbelieving eyes, and walked towards the scene of the crime in measured steps. The whole class stopped breathing, and counted all those 39 steps to the boy due to be taught a lesson for life. Mr Hitler towered over the boy, watching him tremble with fear, and yelled at him, commanding him to get up, which he did as best he could. The boss then ordered him to follow him to his office, suspending the class post-haste. What happened afterwards is a different story, but suffice it to say that an attitude in such a teacher in a medical college could only be called atrocious, if not worse.

Fortunately, with the passage of time, things have changed for the better. Autonomy and human dignity at all levels of society are rights which are taken for granted.

Self-directed learning is a basic component of the adult learning process. It is natural and logical for an adult mind to learn through enquiry, curiosity, exploration and experimentation. The process is particularly rewarding if one can learn something totally new and build up experience and know how to add one more skill to one's portfolio.

A good example of self-directed learning may be seen in the fields of engineering, where an engineer may face a dilemma, and solve it through exploration, experimentation and possibly innovation.

Many surgeons have that attribute too. They would not follow the same routine all the time. Instead they may change the incision, technique of securing haemostats, or raising a flap, etc. An innovative surgeon explores new and more efficient ways, while one who just follows what he was taught may be acting in a pedagogal fashion.

One famous head and neck surgeon in the US dedicated his monumental work to the brave and innovative surgeon who would venture into unknown territories, where no one had gone before. This appears as to be a good motivator for the self-directed learning expected of an adult with potential to progress further. Obviously the renowned teacher did not mean everyone should carry out experimental exploration to find new ways, as the fundamental rule of bioethics is known to us all, i.e. beneficence with non-maleficence. He meant to encourage innovators, leaders and go-getters to explore newer ways, employing the fundamental principle of self-directed learning.

Finally, one must say that Knowles pointed this out to us as an important attribute in the adult learning process, which has a singular advantage over the pedagogal ways of learning through personal guidance and motivation, where one has to be guided each step of the way.

2. The role of experience in andragogy
   Knowles gives massive importance to the experience an adult possesses as compared to a child. Each day in life brings new challenges and fresh memories. A wise person stores them safely and avoids repeating mistakes as he grows in age. An unwise person may repeat the follies and never learn. Both possibilities exist in practical life. After all, the Don Quixotes exist in real life and not just in fiction. However, the majority of adults learn by either performing an act themselves, or learning by observing others doing it. Nevertheless, each fresh experience adds to an individual's experience bank, which enables him to learn even better, harnessing the information gained through experience. Undoubtedly this human attribute is universal. One does not have to be educated to have this particular attribute. Don't we know many a villager who never went to school but was wise enough to be consulted in important family, personal or community matters, as they were worldly wide.

   In Knowles' list of items included in andragogy, the role of experience as a human being plays a significant role in adult education. While a child may have an odd experience of an unusual episode, the adult may have several similar episodes filed in his memory box, which he can recall as and when required.

   In modern methods of adult learning, or andragogy, this attribute of personal experience is employed on a regular basis in PBL and problem solving methods. Given a problem with the necessary information, an adult is encouraged to build up a theorem based purely upon past experience. We will discuss the use of this attribute in the discussion on PBL later on, but suffice it to say that a major difference between pedagogy and andragogy is the factor of experience, which an adult possesses much more than a child. It therefore implies that to teach an adult learner ignoring the invaluable tool of past experience is in fact quite unfair. However, that is the custom in pedagogal teaching in many an institution. Each time the subject is discussed it has to start from the beginning, presuming that the pedagogal learner knows nothing about it. It is denying a fact, and in a way ridiculing the adult mind, which is wrong and seriously damaging to intellectual growth.

   It was recommended by Knowles that this principle of harnessing past experience to educate current practice is of immense values in undereducated adults. Suffice it to say there are hundreds of millions of such adults on this globe. Even in the UK, where compulsory primary education has been in practice for a long time, you may still encounter school dropouts. In the developing countries it is a major issue. Many an educationist in those nations definitely employ this principle in manual workshops, when training someone to be a technician or an apprentice of sorts or instructing them for various diplomas, thus enabling them to be economically viable.

   It is thus a matter of simple logic that one may capitalise on past experience in building the blocks as one goes along.

In the contemporary world, employment of past experience, either personal or familial, etc. is used as a foundation to raise the structure of problem solving, combining new knowledge with old experience. The andragogal method thus has much to contribute in modern medical education.

3. Readiness to learn
This is an adult attribute, to which Knowles grants huge importance. Adults tend to learn more or more effectively when they find a reason to learn, such as to improve their efficiency, productivity and even their contribution in their place of work. For instance, an incentive or bonus or promotion may induce an adult to learn quickly and more efficiently, or apply that knowledge in their practical life. One fine example is the bonus schemes of banks and other organisations. Top ranking executives and others enjoy financial bonuses and other perks for achieving a target within a specified time. In order to do this they will rapidly learn new ways and master new techniques, polish their existing skills and consequently make more money. The principle of readiness to learn could be seen not just in the form of incentives, targets, bonuses, etc., but also in such personal matters as redundancy, loss of employment, sacking, family problems, or relocation, migration, displacement or simply a change of career.

Many examples can be quoted. A divorce could be an expensive gift of parting. One famous stage and TV actor, who retired some years ago, had to return to the stage to pay the alimony for his third divorce. Likewise, a very senior professor of surgery was forced out of his country by unruly lawless elements, to relocate to England. He had to learn rapidly the current practices to be employable by the NHS. He relied heavily on his past experience. With the desire, indeed the need, to learn the latest, he found himself motivated to learn and did well.

Readiness to learn can be motivated by personal needs as well as good deeds. If one wants to continue to progress in life, one has always to be ready to learn. Two kinds of people are often encountered in life. There is a vast majority who are content with whatever they have achieved and live happily ever after. One particular surgeon used to say that the day he passed his final professional exam he went down High Holborn, from the Royal College of Surgeons, Lincoln's Inn, and found the muddy river called the Thames. He dumped his books into it and decided never to read again. That is simply pathetic, to say the least. However, yes, there are people who simply have neither the desire nor the need to learn more. Obviously in due course of time they perish and die. Life is a process of perpetual movement. It is like walking on a treadmill. You cannot stop while the treadmill is moving or you will topple over and hurt yourself.

The second group of people are motivated by personal desire to excel, and remain up to date. They may not have any selfish reasons such as financial reward, job stability, family reasons, etc., but a simple and basic instinct to learn more. They are always ready to learn and to share their knowledge with others. In the process they may have to burn the candle at both ends, but they couldn't care less. For such people, life is all about learning, sharing and disseminating knowledge.

They therefore gain respect and honour from people around them and simply enjoy being productive through knowledge. Some of them may become haughty, but not many. The majority even become more humble as they acquire more knowledge. One philosopher saint advised his disciples ‘acquire knowledge so that you grow into a shady tree that bears the fruit, so that people can rest under it and enjoy the produce; and not like a thorny cactus, that can neither bear fruit nor provide shade.’

Those adults who are ready to learn are usually soft by nature, humorous yet serious, and love and respect their families, colleagues, peers and juniors. Knowledge moulds their personality into a soft, mild, and likeable person.

4. Orientation to learning

Pundits such as Knowles inform us that adults learn because of a predetermined philosophy of life-centred, task-centred, problem-centred orientation. Knowles believes that, for the most part, adults do not learn for the sake of learning, but only for a reason. We beg to differ with that notion. There are a large number of elderly folk that you can find in any public library, doing serious reading, taking down notes or making personal write ups. Some of them are obviously retired, and some just come to enjoy reading. They do not read fiction and novels, an extremely popular hobby in the UK which is also educational, not simply recreational. No, some of these folk are seen reading serious philosophical, theological or social works. Yet obviously they have no reason or motivation or need to learn other than for their personal joy.

Knowles believes that most adults are motivated to learn to fulfil a certain task, solve a problem or live in a more satisfying way. We suspect the last item in Knowles statement applies to all those adults who want to learn for no other reason than the sheer joy of living in a satisfying way.

A story comes to mind of the famous philosopher, scientist Al-Farabi (d 980 A.D.). He was on his death bed when an old friend came to see him. After the customary pleasantries, he asked Al-Farabi of his condition. To which Al-Farabi said, never mind my condition, tell me if you solved the dilemma that we had discussed before I fell ill. As the legend has it; the visitor was perplexed by the desire of the dying man to learn, to which Al Farabi turned his way lamenting ‘O Sheikh, even you wish me to die in ignorance’! So here is an example of learning for sheer joy.

No doubt many adult education workshops are conducted on the principle of ‘relevance to the learner’s life tasks or problems’. Many such workshops are useful but not all. Many participants join these workshops as part of their compliance with management instructions. So, if you observe these participants, they appear to be withdrawn, engaged in playing on their smartphones, texting or simply yawning. It is not a general rule, but quite a common observation. Despite the fact that the learning process may be quite interesting, as these workshops are conducted by seasoned facilitators who have seen it all, one can easily detect a general desire for the participants to get it done with, sign the attendance sheet, obtain the mandatory training certificate and run off.

Knowles believes that one of the tasks of the experienced facilitator is to develop 'the need to know'. It is sometimes seen in practical life. A top class facilitator will actually apply this dictum of adult learning by creating a niche in the learning portfolio of the learner. However, this is an art only a few have. Unfortunately, most workshops and facilitator are run of the mill, and often not conducive to exciting or inciting a genuine desire to learn.

5. Motivation to learn

   It is a matter of simple observation that most adults learn on account of external pressures such as those we have discussed earlier, such as climbing the ladder, financial rewards, bonuses, perks and expensive holidays, etc. However, some educationists believe that internal motivating factors also play an important role in some situations. These elements are slightly less tangible than the external factors mentioned above; for instance, personal satisfaction, recognition in the profession or society, the family circle, peers, going up the ladder in life on account of better knowledge and qualifications, self confidence, and above all a simple desire to be fully informed and useful to the world at large.

   Many people are motivated by family customs. If a senior family member has a habit of reading books, the juniors will follow suit. If the elders in the family have a habit of sitting in front of a TV for hours on end, the youngsters will do the same. In a peculiar way, television has severely damaged old fashioned family conversation that used to be the norm a few decades ago. Everyone keeps quiet as the TV dominates the scene!

Andragogal philosophy is simple and logical. Motivation to learn is a natural process, and a tendency often related to the environment. If the environment is conducive to learning, a natural desire to learn, motivated, indeed initiated, by the surrounding atmosphere will follow. Adults behave differently to children. While a child has to be motivated to learn, an adult usually finds the motivation to learn for many reasons, as discussed before.

The concept of adult education is neither new nor revolutionary. Adults have always wanted to learn. If for some reasons, such as economic factors, early employment, or simply neglect during childhood, an adult could not obtain an education, he will usually try to either pick up a skill or go to an institution where late entries into the fold of education are encouraged. Remember, seeking knowledge is every body's birthright, which can be achieved through personal effort.

Many women take a break from their education to raise a family. Once the job is done, their desire to go back to education becomes manifested in more than one way. They might join part time courses, take short modular courses, or join a university as mature students. Age has ceased to remain a barrier for entry into an educational programme.

A very senior professor in Scotland took retirement as soon as he reached the age of superannuation, left his medical practice and joined the university as a mature student to learn more about Scottish history and to do a masters degree. Obviously his intention was purely a personal desire and motivation to fulfil his ambition which he could not do during his medical career.

It is often said by academia in the UK that after retirement you may go back to the university to study subjects you always wanted to learn about but were prevented from doing so by pressure of time or professional demands.

Desire and motivation to learn is often an inherent element. However, sometimes external factors also contribute. A renowned professor of surgery could not cope with the material commands of meeting certain targets in a teaching hospital in England. One day he was so cheesed off that he left a procedure in the middle, instructed his registrar to complete it, went up to his office, wrote his resignation, and simply walked out. He disappeared without creating any ripples, and literally became a recluse. Years later his colleagues discovered he had joined a university to study the history of ancient castles and cathedrals in northern England, something he had always wanted to do, but couldn't, until circumstances forced him to. Modern managed health care may have come to him as a blessing in disguise! What the profession may have lost is another story.

Finally, let us summarise the comparison and contrast the two primary modes of principles of learning, namely pedagogy and andragogy.

Pedagogy is a time honoured, time tested, established principle of learning. andragogy is a highly innovative, challenging, and relatively little tested principle which must develop before all and sundry can adopt it.

Pedagogy is teacher-based, teacher centred, teacher and environment controlled way of learning. andragogy, on the other hand, grants freedom to the learner, as it is a student centred, student-based, student guided independent way of learning.

Pedagogy is based upon the cognitive domain of memory and recall. andragogy is based upon the problem solving and affective principles of medical education.

Pedagogy is lecture-based, so it has a definite plan, with limited boundaries, restricted thinking processes, and is devoid of analysis or synthesis of thought, information, data or knowledge base. andragogy is based upon the concept of employing small group discussions, debates, interaction, one to one conversation, and data processing, analysis, synthesis and problem resolving.

Pedagogy is economical in terms of logistics, faculty training, facilities, etc. as it employs basic facilities such as a good teacher who can teach a large number of students at the same time, blackboard and chalk, or a white board, PowerPoint presentation, or sometimes overhead projection devices. andragogy is more expensive and time consuming. It needs multiple small rooms rather than a single large lecture hall, faculty has to be manifold and trained accordingly to use modern methods of teaching through interaction, stimulating debate, facilitating only if required, etc. Other logistics facilities are nearly similar except for the use of a lot of flip charts in small group discussions.

The most salient difference between the two, however, is that pedagogy restricts the human mind, not quite promoting critical thinking, whereas andragogy stimulates critical thinking, allowing free interactive debates and lateral thinking which may sometimes have to be controlled by the facilitator by steering the discussion back to focal points.

Finally, pedagogy is good for young and growing minds which have sharp memory skills. andragogy is better for an adult mind with relatively reduced memorising capacity, but far better attributes of analysing critically a meter based upon fact and reasoning.

Therefore it may be said that andragogy is more suitable for a more mature mind as in a medical school, and pedagogy is better and safer for young and relatively less mature minds, as in a high school.

1.2 Bloom's Taxonomy

Benjamin Bloom may safely be called the founder of educational taxonomy. His work has stood the test of time. All kinds of educationists have harnessed his principles and their applications in their curricula.

Medical education is no exception. Nearly all medical educationists employ Blooms taxonomy in their educational practices.

It provides a basic, practical and highly influential structure to build a block of education, indeed a building of immense strength, and versatility.

Bloom's taxonomy assists and guides teachers to concentrate on higher order thinking by developing varying levels of thinking, developing performance orientated tasks, designing questions for students, and evaluating the students activities and programs Benjamin Bloom's hand book 1 and 2 (1956).

Obviously Bloom was a master of the human psyche and intellect. He therefore designed various levels of increasing importance, relevance and significance in acquiring knowledge using a staged methodology. Each level was recognised by a specific key word. Each key word was chosen with care and precision to focus on a certain level of thinking. And thinking was based upon the principle of critical evaluation. So each stage was identified with a given key word, with an underlying theme base upon critical thinking.

The whole process was developed in such a way that the question for critical thinking could be designed to stimulate, cultivate and generate a process of critical analysis of a given task. Questions could then be developed further to assess higher domains of learning such as problem solving skills. Attitude was included in the designing of lectures and questions. The most important element of education, namely evaluation and assessment, could then give a true picture of the entire process of teaching and learning through a well designed, structured process.

Bloom is given the due and richly deserved credit for introducing various levels of an educational activity. He identified the following six steps.

Level I: Knowledge
Level II: Comprehension
Level III: Application
Level IV: Analysis

Level V: Synthesis
Level VI: Evaluation

1.2.1 Blooms Level I: Knowledge

This fundamental level of the process of learning displays the memory and recall phenomenon based upon a collection of words, events, activities, etc., which are duly stored in the memory cortex and recalled on demand. Simple key words, such as what, when, why, where, who, etc. are used at this stage.

The primary mode of imparting knowledge that we all went though in our early years are a good example to quote. For instance, matching a picture with a name or vice versa. Many nursery books are a good illustration of this level of Bloom's taxonomy, which is indeed the first brick in building the future.

1.2.2 Blooms Level II: Comprehension

The second level is an obvious step to follow. Once a word, topic, subject or story is read, the next stage is the ability to understand the meaning, or the purpose, of the given activity. So comprehension of a task is the natural corollary to the initial step. The human mind has a natural tendency to compare and contrast facts and figures, observations and actions. Besides, another natural element of mental exercise is the attribute of explanation, demonstration, description, classification, illustration, etc. All these elements are included by Bloom in this stage of his taxonomy.

1.2.3 Blooms Level III: Application

Bloom believes that once the student has acquired the trait of knowledge, memory and recall, and indeed shown he has understood it through an act of demonstration, the next logical step should be that of Application. What it means is that the student should now be able to find a solution to the problem. In other words he should now be able to solve a problem. The knowledge base compounded with fresh knowledge and its understanding enables the student to be a problem solver. The key words recommended at this step are Choose, Develop, Identify, Organise, Experiment, Select and Solve.

1.2.4 Blooms Level IV: Analysis

For an educational activity to be fruitful and productive enough to justify the effort, it is this step which is most significant. It is the step of Analysis. The knowledge, memory and recall as well as the understanding of the nature of the problem followed by his ability to solve it are conducive for a student to analyse the data, results, inferences and explore true and substantial evidence to prove a given general statement, hypothesis or theorem. So the key words which are often used at this step are analyze, categorise, distinguish, differentiate, compare and contrast, examine, evaluate, inspect and justify.

1.2.5 Blooms Level V: Synthesis

One of the finer attributes of the human mind is the ability to assimilate information, store it, analyse it and synthesise it. The process involves not just relying upon information stored or available but actually the capacity to search the requisite information at a given time and present it in a new format. This is called synthesis. It uses such key words as choose, compose, develop, design improve, modify, etc.

1.2.6 Blooms Level VI: Evaluation

Being judgemental is sometimes not seen to be good in day to day life. In education it is an essential attribute. To be able to judge, opine, defend and promote a certain decision in an educational activity is part and parcel of the whole process of learning. One should develop the ability to look at a given piece of information, evaluate it on the basis of certain parameters, validate it and approve (or reject) it.

The process of evaluation uses such key words as measure, justify, recommend, select, agree, opine, disprove, commend or reject, etc.

1.2.7 Learning Domains

The principles of learning set out their approach with the objective of gaining desired outcomes on the learning domains, identified by experts in the field of education.

They are:

Cognitive domain.
Affective.
Psychomotor

1. Cognitive domain
   The Cognitive domain relates to the very basic learning attribute, namely memory and recall. In fact, it is an attribute possessed by human beings in varying measures. There are those who are known to possess a photographic memory. They just have to glance at an object, a writing, a painting, an objet d'art or a panoramic view and can reproduce it exactly as the original. Many famous painters are known to have such memories. Some of them also had lateral thinking. It is said about Leonardo de Vinci that he had an exceptional mind and a photographic

memory. Apparently he was dyslexic and could draw a mirror image picture as his mind saw it. Allegedly he would send his love letters to his sweetheart written in reverse letters so that no one but the fair lady could read it, reflected in a shining brass plate. He obviously had an unparalleled creativity in his mind to have presented to the world a Mona Lisa, just to mention his one icon.

There are also people who can barely record an event, a write up, a lesson or a story in their mind. They have slippery minds with no or limited power of retention. Such people may be geniuses of a different sort, as they may be able to solve a conundrum or a puzzle in a jiffy but not remember their home address.

However, the majority of the people fall into a category in between the two extremes. We can all remember some facts, but not everything. We can also recall events on demand. The earliest memories in life, according to child psychologists, are etched in our memory cortex like permanent marks, never to fade, but after some years each day reduces the cerebral capacity to absorb and retain in sulci and the gyri of the memory cortex. This is one reason why children have much sharper memories than old folk.

Educationists have always relied upon the role of memory and recall as a platform or a scaffolding to build the structure Hudson and Watson (2007). The pedagogal mode of teaching is all but totally dependent upon the factor of rote memorisation, and recall. This is why it is a popular way of imparting education to younger minds. As we mature, our memorising capacity diminishes and we tend to find it hard to remember what we learnt last year or before that.

This is also the argument in favour of an integrated curriculum as subjects taught fresh are more productive in developing a clear concept of the subject. No doubt the best and the lasting way to remember a thing permanently is to have a clear concept rather than a fleeting memory. Conceptual understanding is indeed the best way in medicine.

Different instructional strategies have different bearings upon the learning domains, which we will discuss as we proceed.

2. Affective domain

This attribute of learning has more bearing in medicine than in any other subject. It is the attribute that all physicians must possess, cultivate and hone as they move forward in their lives.

Mannerism, behaviour, and attitude are other names for this attribute.

From ancient times to the present day, mannerism or bed side manners, as often described in tales and fiction, is what every doctor must possess; without this his healing powers may be ineffective.

Apprenticeship was the common mode of transfer of knowledge in ancient medicine. It is still in vogue but perhaps less so than before. Everything has become abstract and impersonal. However, the principle underlying the practice of apprenticeship was that a pupil spent a long time with the master and thus by a natural process of osmosis the pupil absorbed the attitudinal precepts almost imperceptibly from the master and applied these in his practical life.

The paternalistic approach served the purpose well, as the mannerism was limited to simple measures and was easy to apply. Due to the explosion of knowledge and technology in the last few decades, the whole philosophy of the doctor–patient relationship has undergone a sea change. It is therefore necessary that medical ethics be taught as a separate subject. A whole chapter is allocated to the subject in this book.

It is not just medical ethics but also such attributes as communication skills, leadership qualities, body language, objectivity in life and several other factors that fall under the topic of affective domain

3. Psychomotor domain

   The whole purpose of medical education is to solve the problems of a patient. A physician must possess due skills to achieve this objective and that is what this domain entails.

   A complete physician must possess a balance of knowledge and skills. As mentioned before, Saint Ali said that 'knowledge without skills is like a bow without an arrow'. How apt indeed.

   There are many physicians who have encyclopaedic knowledge but little or limited technical skills. Such a doctor may be able to serve as theory master in an institution, but hardly prove to be an asset in practical life.

   On the other hand, there may be a surgeon who knows how to use his knife and do it exceedingly well, but would not know why is he doing it or, indeed, whether he should do it at all, because of poor knowledge. He can solve the problem as he is a good technician, but he is unable to tell his students exactly what, why and how he was doing it.

   We recall one such surgeon in a university hospital who called himself a 'cutter', as he confessed he had not read a book or a journal since passing his exit exams. He thought they were meaningless and left it to the academicians, while he removed a few more organs. How pathetic is that!

   So a balance is vital for both physician and surgeon. It is not simply a question of deciding when to perform surgery, but indeed of knowing why if at all it is indicated.

   In practical life we encounter many such technicians who will fix your car or a leaking water pipe but do not know the theory behind it.

   To be a nerd is as bad as being a cowboy technician. Shooting from the hip level is not allowed in medical profession. One must know the reason and the fact before pulling a trigger! A knife-happy surgeon is as condemnable as a trigger-happy cowboy!

Modern education supersedes the traditional form of teaching in this major way, as it duly emphasises and grants unparalleled importance to practical, problem solving strategies. Skill laboratories have given a totally new dimension to medical education. The student applies the fresh knowledge in the skill laboratories, thus embedding the knowledge and its practical application in his cerebral cortex forever. What better way to impart education than to show the student how to solve a dilemma.

Furthermore, with the introduction of simulators and structured subjects involving virtual, and computerised images, we are witnessing a total revolution in medical education.

Now let us compare different instructional modalities on the basis of three learning domains as discussed above.

Traditional lectures are a common practice. These didactic sessions gain 3 points in the Cognitive domain, but only 1 point each on Affective and Psychomotor domain.

Reading has similar points to score – so there is not much choice.

PBL scores only 1–2 points in Cognitive domain, and 2 points in Affective, but the maximum, i.e. 3 points, in the Psychomotor domain. So it has a singular benefit in terms of the practical life of a physician, but the poor cognitive element is something to worry about.

Let us now compare three other modes of instruction, namely, the Role models, Programmed learning and the learning projects.

It appears that all of them secure 3 points each in the category of Cognitive domain, and 2 points each in the Affective category for Role models and learning projects, but Programmed learning secures 3 points in this category. So it has an edge in terms of additional qualification, often the reason for this strategy to be used in contemporary education.

Finally, in the category of Problem solving, i.e. psychomotor skills, the Programmed learning strategy gets 3 points but the other two only 2 points each. So the educationists prefer Programmed Learning as an essential way of teaching through this attribute.

Obviously these parameters are challengeable variables, and leave a reader fairly confused as to the choice most suited for a particular group of students. Frankly there is none.

The educationists have to choose according to their needs. We feel a hybridised model is the best answer. The short introductory lectures at the beginning of the PBL session supplement the knowledge base. It can be followed by the PBL as the main mode of instruction for the graduate students and the traditional way for undergraduates.

Motivation to learn can also be part of family habits or practice. A house with books in the bookcases is a home where youngsters are motivated to read because the adults motivate them to do so. And the adults feel motivated to learn even more as they feel morally obliged to gain more knowledge and skills to pass on to their young.

In this context is a study worth reporting. Kusurkar et al. (2012) believe that, according to educational psychology, the learning processes can be mapped in three dimensions:

1. Cognitive (what to learn)
2. Affective or motivational (why learn)
3. Metacognitive regulation (how to learn)

They believe that, in a truly student-centered medical curriculum, all three dimensions should guide curriculum developers in constructing learning environments. So in this study they investigated whether student motivation has guided medical education curriculum developments

So they reviewed the literature on motivation theory related to education and on medical education curriculum development to identify major developments.

Following an exhaustive study, employing the 'Learning-Oriented Teaching' model as a framework, they evaluated the extent to which motivation theory has guided medical education curriculum developers.

The study duly pointed out that the salient developments in the field of motivation theory indicate that motivation drives learning and influences students' academic performance, that gender differences exist in motivational mechanisms, that the focus has shifted from quantity of motivation to quality of motivation and its determinants, and how they stimulate academic motivation.

These workers also gratefully noted that the medical curricula include the introduction of standardized and regulated medical education as well as problem-based, learner-cantered, integrated teaching, outcome-based, and community-based approaches. These curricular changes have been based more on improving students' cognitive processing of content or met cognitive regulation than on stimulating motivation.

It was therefore concluded that Motivational processes may be a substantially undervalued factor in curriculum development. The authors believed that, if the curricula are developed to stimulate specifically motivation in students, the results may show positive outcomes. They further highlighted many factors essential for stimulating intrinsic motivation in students, including autonomy support, adequate feedback, and emotional support. They believed that some of these elements appear to be lacking in curricular planning.

An essential component of curriculum design is Instructional strategies or learning and teaching methodologies. Any syllabus has to be completed in a given period of time. The topics are so divided amongst the faculty that each relevant portion is covered comprehensively by a given teacher in a stipulated time frame. It is achieved through didactic lectures, small group discussions, tutorials, practicals, and skill laboratories – a combination of some or all of them.

As discussed elsewhere in this book, modern medical education has seen a paradigm shift in instructional strategies, moving away from larger classroom lectures to small group tutorials, PBL or various other forms of learning.

Self study time is as important as the teacher-based learning. In fact, some individuals learn more through either self study as an individual or, more often, as a group. In medical schools, particularly in the basic sciences, many students prefer to discuss and debate the topics with their friends rather than sit in a class and simply take notes. It also depends on the maturity of their minds. Those who have relative less mature minds rely heavily upon their teachers to dictate those notes, identify the salient topics to remember, etc. On the other hand, more mature students prefer to take guidance from the teacher but find their own way to grasp the subject through a particular design best suited to them.

Group learning is fairly common in medical schools. Perhaps one of the reasons is that mutual discussion dissects out the topics for better comprehension and hence better retention. Besides, group discussion is a way of learning through teaching. As said by wise men – the best way to learn is to teach!

In modern educational practices, e-learning has become mandatory. More books, journals, articles, etc. are now available online. So instead of relying upon textbooks, some of which may become outdated even before the printed version is on sale, students prefer to pick and choose the latest information online.

It has often been said that the days of the conventional library are over, but that may not be true. Good libraries will always remain the major resource centers, but sadly some of them will simply fade way. The e-book is already becoming the norm. Not only are they economical in cost, but they also do not occupy precious space on the shelf. The joy of reading a book is incomparable to any other form of reading, but with modern gadgets so rapidly taking over, few will find that joy coming their way easily or economically.

1.3 Conceptual Theories of Learning

Medical education is based upon general educational theories, albeit it is more applied than many other fields such as humanities.

The profoundness of knowledge depends upon many factors, such as the personal desire to learn and excel, the logistics and learning environment, the curriculum and above all the faculty. If all the ingredients are mixed in the right proportions, one gets a fine end product – if not, then vice versa.

The fundamental principles of education comprise:

Teaching, curriculum, faculty
Cognitive psychology of the students
Social factors

Teaching is an art which is often a natural gift, duly honed over the years through personal efforts, desire to improve, and guidance from masters in the field. This is why it is true to say that, despite natural talent, a teacher should go through formal training to become a master teacher. In most primary schools, a young man or woman wanting to be a teacher must pass a certification course and go through a training process to get a teaching job. Does that happen in medical schools? We guess not. Somehow, it is expected or presumed that if a physician has passed his fellowship or membership, or any other higher diploma in a given field, he would naturally and automatically become a good teacher. Not true. Many highly educated physicians are quite unable to part with their knowledge in an orderly fashion. This does not mean they can't explain – or indeed know – the subject. They do, but once it comes to teaching they may not be as effective as a physician who may have learnt the art through proper teacher training.

Regrettably, though, not many physicians opt for such a course. In fact, until recently, not many options were available anyway, but now in many centres there are special workshops, diplomas, certificates, masters degrees, etc. in medical education to be aimed at.

As to the curriculum, one can say that it is the soul in the body of medical education. We will discuss it as a separate subject in a chapter later on. However, suffice it to say that, since the days of Flaxner, it is the curriculum and the core content of the syllabus which have been the main concerns in the field of medical education. As mentioned before, the whole philosophy of teaching in medical school, whether preclinical or clinical as is arbitrarily divided, the curriculum determines the value of the end product. It is like saying that if the curriculum is too exhaustive you may not be able to cover it in a specified period of time, producing half cooked physicians. Conversely, if the syllabus is too thin and sketchy, you may produce imperfect physicians with little theoretical back ground. Of course knowledge must be matched with skills, or the end result will not be desirable. We will discuss it at length in a chapter later on.

Then there is the question of the faculty. Teaching is a process of achieving a certain end product. In other words, it is a means to an end. Without appropriate acuity, one medical school may succeed. Concepts of the quantity or the forum of faculty have changed over the years.

1.3.1 Students' Cognitive Psychology

Every human being has his individual cognitive attributes. Not two persons, not even identical twins, will have identical cognitive capabilities. Some are better in rote memorization, others at problem solving. Many folk can think laterally, which enables them to bypass or ignore trivialities and arrive at the conclusion much faster than their cohorts. Then there are some dull people who have neither the capability to memorize and recall when required nor an analytical mind. So cognitive levels vary from person to person, and this affects human psychology. In turn this influences the learning abilities of a person. In fact most psychologists believe that teaching should be relevant to the level of cognitive psychology of a batch or firm of students. It is simple to understand if extrapolated in practical life. For instance, if a teacher tries to teach Euclid's theory of advanced arithmetic to a batch of medical students who do not possess the cognitive level for fathoming the same tables, he is just hitting his head against a brick wall. In the same way, trying to stimulate the imagination of a 5-year-old to solve the dilemma of the Higgs Boson particle would be unwise, to say the least.

Human psychology is a complex subject which is quite difficult to fully understand. In the field of medical education, it certainly plays a significant role, which is fully understood by most medical teachers.

1.3.2 Social Factors

The environment plays an important role in any form of human development. Education is directly affected by socio-economic factors. It is a common observation that children from educated families do significantly better than, say, working class people. It is not an exceptional rule though, as often enough children from an economically low background not just do well but excel in education and their careers. However, by and large one would agree with the ground realities that parents with decent incomes can provide a better learning environment, better schooling, housing, library facilities, computers, extracurricular activities than those without. It may not be a major issue in the developed world, but in the countries of Asia and Africa with struggling economies, the observation stands firm, as many children can't even dream of going to school let alone medical college. Many stories exist of children younger than 12 or 13 years of age having to work in factories or other workplaces to feed themselves and their siblings in India, Pakistan, Bangladesh, etc. It is a massive tragedy and total failure of such countries and their rulers that in this age children are deprived of an education living in slums reminiscent of the Dickens' days, no doubt some even working for an Asian Fagin!

Social factors also play an important role through peer pressure as children with matching backgrounds are obviously forced to come with their cohorts. So, for instance, if the next door neighbour goes to a public or a grammar school, the other child would also like to do the same and so would the parents.

In the context of medical schools we see this element of social and economic influence in private medical schools compared with state schools. Although state schools are excellent, private schools are significantly better, in terms of facilities, logistics, learning resources, faculty, etc., and overall achievements in higher exams. One fine example we can quote is that of Dow University, a state owned medical teaching facility in Karachi and the Aga Khan University in the same city. Despite the huge bias in favour of Dow University, the truth is that the Aga Khan has far better facilities, intake, output and end product. Similar examples can be found in many other countries too.

Now let us turn our attention to the *orientation theories* of learning.

1. Cognitive
   Education psychologists inform us that learning is a mental exercise, which is intrinsic, inherent and rather obscure. It is more a chemical and biological process than physical or anatomical. It involves a whole series of activities requiring a chain reaction, beginning with the input of information, its absorption, synthesis of thought, analysis, and ultimately arriving at a culmination point when reaching an end point.

   Teachers play an equally important role in the process of learning, by exciting the students' intelligence, memory, and capacities to synthesise, analyse, formulate and employ cognitive domains to avail of an end product. This is why teachers have such an important role to play in education at all levels. Of course, with the modern ways of self study and guide books, teachers' jobs have become simpler but not diminished by any measure or means, as they are the ones who develop those guidelines and learning portfolios.
2. Humanistic
   Most educationists advise us that learning is considered to be a selfish or at least a personal act. The reason behind that notion is that one learns to act to achieve a

certain objective in life. So in the process one becomes fairly autonomous. This is of immense value in adult learning. This trait in turn is further cultivated by teachers through intelligent use of methods involving affective and cognitive attributes. The end result of such an exercise is usual highly rewarding as the individual develops the habit of solving the problem by critical thinking, employing the factor of memory and recall to reach that goal. Knowles' andragogal theories are based upon this principle, where an adult finds a reason to learn, which in turn yields satisfactory results, thus propelling the individual to look for more reasons, acquire more knowledge and progress further in life. Out of the three domains of learning, this theory is based upon employment of cognitive and affective domains, i.e. memory and recall as well as morality and ethical perspective. Undoubtedly the ethical aspect of the domains is somewhat neglected. It is the third dimension of medical education, besides knowledge and skills. Due to the rapid extension of knowledge and technology, current medical curricula have begun to teach medical ethics as an independent subject. And about time too!

3. Constructivitist

   According to the educationists who believe in this theory, experience plays an important role in the learning process, as is commonly seen in apprenticeships. An apprentice performs an act, gains experience, and harnesses this information to learn something new. The teacher of the facilitator or the supervisor fully understands the importance of experience through experimentation and facilitates the learning process by guiding when necessary so that the learning process becomes simpler and more productive. Economy of time also plays a role here, as extensive experimentation to gain more experience may not exactly be economical.

   Constructive orientation has played a major role through the history of medical sciences. Well before the formal ways of transferring knowledge and skills by the master to the pupil, it was the apprenticeships that were the constant source of learning, through observation, experimentation, consultation and personal endeavour. The close bond between teacher and pupil, which lasted several years, resulted in the pupil absorbing everything and applying it in his own practice when his turn came, and then transferring the knowledge and skills to his disciples by employing the same methods that had benefitted him.

4. Social orientation

   Mankind is bestowed with power of social interaction, and learning through such an action. In the animal kingdom generally, one observes the same phenomenon as apes and chimps learn from each other through interaction and social activity. The major difference is that mankind has a choice of developing, cultivating and promoting interpersonal relationship, based upon the attribute of reason, so we chose as we want, and use these relationships to learn through observation, contact, mentoring, monitoring and looking up to our role models, hopefully to follow in their footsteps.

5. Behaviourist learning process

   The influence of external stimuli is well known, but some educationists specialise in creating special circumstance to stimulate the learning process externally.

Their strategies are usually based upon employment of skill laboratories, skill tools, case-based discussions, scenarios designed to stimulate learning and develop a multitude of efficient and proficient ways of stimulating the learning process through external stimuli. It is one highly motivating way of imparting new skills to the learner, but the facilitator's or teacher's job becomes more demanding as constant change of scenarios or stimuli is needed. It could also be time consuming and economically challenging but the end product is always worth the effort.

Education is a dynamic process. It continues to evolve with time. The process is often slow but steady and a change occurs only after a particular system fails to meet society's expectations.

We have seen that Flaxner's report heavily influenced medical education for nearly the whole of the twentieth century. In fact the curricula developed under its influence are quite valid even now. However, a need for change was felt by some major universities in the 1960s, perhaps earlier. Society had changed and the curricula were becoming somewhat over burgeoning and overloaded. The principles of teaching have remained the same as indeed the theories and the concepts. However, the strategy had to be modified as was initiated by McMaster, followed later by many illustrious universities across the globe such as Maastricht and Dundee. It has not been a domino effect at all, as the academicians who matter are wise people. They use rationality and not emotion in decision making. These decisions are radical and have far reaching effects on generations.

1.3.3 Knowledge

Athens remains the city which gave the world many great philosophers. Plato was one of them. He defined knowledg*e* as *virtue*. This definition has stood the test of time. No religion or faith, or indeed the lack of it, may challenge this definition. In fact, a believer or otherwise, all would agree that virtue is an attribute that is desired by all to own and possess.

Truth is a virtue, courage is a virtue, patience is a virtue, and there are many other similar attributes, which are strongly liked and promoted by all good human beings. Western philosophers from Thomas St. Aquinas, to Kant, and from Voltaire and Bergson to Bertrand Russell have written voluminous treatises on ethics. They have all discussed virtue as an inseparable component of ethics. However, Aristotle must be given the top spot as his famous book called Nichomachaen Ethics is all about virtue. In fact his Virtue theories have stood the test of time, though for a while subdued by Kantian philosophy of Deontology, and Bentham and Stuart Mills' theory of Utilitarianism. A modern philosopher McIndyre has brought Aristotelian virtue theory back into focus as Neo-Virtue theory. One must study them to realize that, of many virtues, it is the virtue of Knowledge that is the most potent of all. It is because of knowledge that one is able to differentiate good from evil. And that is the crux of the matter and the very soul of all ethical principles.

Here is a description of knowledge that excels by far any of the definitions or qualifications of knowledge.

Ali Ibne Talib the philosopher – saint of Islam, defined the attribute of knowledge as follows:

> Its head is humility, its eye is freedom from envy, its ear is understanding, its tongue is truth, its memory is research, its heat is good intention, its intellect is gnosis of objects and matter, its hand is compassion, its foot is visiting the learned, its resolution is integrity, its wisdom is piety, its abode is salvation, its helmsman is well being, its mount is loyalty, its weapon is softness of speech, its sword is satisfaction, its bow is tolerance, its army is debate with scholars, its wealth is mannerism, its stock is abstinence from sin, its provision for journey is virtue, its drinking water is gentleness (politeness), its guide is divine guidance, its companion is love of the elect. Al-Kulyani, al-Kafi, kitab Fadl al Ilm, Bab al Nawadir. Source: Nhajal Balagha. Courtesy: Mohsin Raza, Iran.

1.3.4 Teaching Strategies

There are many ways of imparting knowledge Laurillard (1993). The most original and perhaps rather antiquated method is the 'observational strategy', where a pupil spends considerable quality time with the master, observes his attitude, his ways and means, and absorbs his thoughts through a process of 'osmosis'. It was and has been the way through the history. The monks and the monasteries used this method when they had total control over education, and the Hakims used it for their apprentices to learn the art of communicating with the patient, observing the demeanour, clothing, style, walks, facial expression, any tell-tale signs of illness, and then checking the pulse with intent and purpose, learning the art of preparing ointments and link mementos, etc.

This observational method is still in vogue in many professions. In medical schools the best example is seen in clinical teaching, where a clinician demonstrates all the salient steps necessary for patient management, namely history taking, physical examination, ordering investigations or performing a procedure.

The more common method of teaching in medical schools is the practice of lectures. Despite the current air of discontent, the format of lecturing is what has taught us whatever little we know. So one cannot discard or ridicule them, albeit modify them to suit the present environment.

As mentioned before, effective lecturing is an art. Not every clinician can be or is bound to be a good teacher. It all depends upon individual abilities and the methods used to present a lecture.

The perceptual orientation of the student mass varies from school to school and region to region. By and large, three modes of delivering the message through lectures are in practice in most medical schools. They are:

Visual

The teacher may use graphics, drawings, picture, photographs, or PowerPoint to create a visual impression on the student's mind. My teacher (Zaidi) in anatomy, the legendary Professor RJ Last, was a master not just in anatomy but also drawing descriptive pictures of muscles, ligaments, arteries, nerves, etc. on a blackboard, using multi-coloured chalks. His visual art is still fresh in the memory of his students, after all these years.

Auditory

A good teacher must be a master orator. He should be a wordsmith, an artist in harnessing words as and when needed. He is like a jeweller, who picks up a tiny precious stone from a bunch to fix in a particular ring where it will shine like a star. The quality of voice and its modulation are equally important. A thin squeaky voice may destroy a fine lecture and leave nothing but bad memories in a pupil's mind, while a cultured and cultivated voice with appropriate pauses, or raising and lowering the volume, certainly make a lasting impression and student may find it easier to remember and enjoy. Likewise, some students like to listen to a recorded lecture and learn better from it, others prefer to read aloud to absorbs as much as they can. So, the auditory pathways are effective modes of transferring knowledge.

Moto-tactile

Among the natural senses we possess, the moto-tactile sense is quite the basic attribute we employ a great deal in learning throughout our lives. If you watch a baby, he will first look at a new item or object in his surroundings on account of curiosity or novelty, then reach for it to touch, feel and learn about it. This trait continues to develop as we grow older. In fact, in clinical practice the same fundamental approach is duly modified in the form of first inspection, then palpation. For instance, if we look at a lump in the front of the neck, we should observe it by looking at it in an orderly way, then feel its texture, assess its size, feel for tenderness, and so forth. Kinaesthetics, therefore plays a massive role in a surgeon's life. Remember the old dictum that the index finger of a surgeon is his third eye. Teachers employ this attribute quite effectively in demonstrating through a model, a practical demo, or nowadays in the clinical skill laboratories, where a student feels and practices various clinical skills on mankind, such as CPR or laryngeal intubation, or indeed a simpler procedure like measuring BP.

Simulated or structured patients are currently being used in most skill laboratories, and they are a good source of teaching and learning the art of dealing with real patient.

The use of moto-tactile ways of learning and teaching are time honoured, established and extremely useful tools of learning.

Gasha has described five useful ways of defining teaching styles Gasha (1996). These are called modes of integrated teaching styles:

1. An expert
   Technically, an expert educationist determines the needs of students in terms of volume, type and content, and convey the relevant information to the student body. He is also responsible for ensuring that the students are competent to get the best of the learning experience from the teacher.
2. Formal authority
   The person holding the position of formal authority appreciates and grants due value and due importance to knowledge. An essential part of formal authority is to gather and provide positive and adverse feedback on the process of learning and teaching to establish such parameters in line with the desires and expectations of stakeholders.
3. The personal model
   A teacher who wants to be a personal model of teaching does so by demonstrating the principles and practices of the fine art of teaching by establishing a prototype.
4. Facilitator
   The role of a facilitator is to act when needed, only by raising relevant questions, directing the discussion towards an objective, encouraging the students to be independent thinkers and learners and generally supervise their activity. Facilitators are commonly used in small group discussions, skill laboratories and in experimental works. Their job is to facilitate and not intercede, dictate, dominate or be didactic.
5. Delegator
   A person confident enough and with faith in the capabilities of his students. He allows them to learn independently and free from interference. Guidance and directions are always available on demand, but unnecessary disturbance to a student's autonomous learning process is duly discouraged by a delegator.

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2 Curriculum

The curriculum lacks a dedicated, specific definition. It is basically a method, a modus operandi, technique or strategy employed in teaching. A curriculum is best defined as a planned educational activity.

It must not be confused with the syllabus, which actually contains all the elements desired to be taught.

A curriculum is a dynamic subject. It is an intellectual exercise, more a journey through which the student body is taken to arrive at a particular, predetermined point. It must keep active and alive, and remain in touch with ground realities. It must also meet the changing needs of time. A curriculum remaining static or unchanged over a length of time may be outdated, outmoded and, quite simply, dead!

There are many ways to discuss curriculum development, its evolution and other relevant attributes, but perhaps the finest approach is the one described in standard textbooks related to medical education, and those developed by Taba, Tyler, Yura, Torres and many others, as well as the works of McHaghie and Golden (pp 4, Chapter 1: Curriculum development book, Kern et al. 1998).

A *six-step method of* curriculum development is probably the best approach, and this forms the basis of the discussion in these pages.

The following steps should be followed.

1. Assessment of the general needs, and identification of the problem
2. Assessment of the needs of the targeted student population
3. Identification of aims and objectives
4. Instructional strategies required, designed or implemented to achieve the desired goals
5. Implementation and application of the curriculum
6. Evaluation and feedback

There are various ways of discussing the topics mentioned above, but it is probably best to discuss keeping the interest of stakeholders in the forefront.

Health care needs mainly affect the patient, the community and the health professionals.

S. Zaidi, M. Nasir, *Teaching and Learning Methods in Medicine*,
DOI 10.1007/978-3-319-06850-3_2

Amongst all the relevant factors, it is the patient whose interest must remain at the top of the agenda. Any health needs not reflecting the needs of a patient may not be representative of the people in a particular community. The community is formed by a conglomeration of people, some of whom may be healthy, others unwell. What needs to be investigated is the epidemiology of any specific disease if it affects a particular community or a particular group. By and large it is the overall health needs of a community of people which affect the development of curriculum. Factors such as clinical outcomes, quality of life, quality and extent of health care, efficiency of health services, cost and benefits of treatment, effects of economic productivity caused by illness and its effect on the community at large will all contribute towards the assessment of patient needs and hence of the community per se.

As the factor of equality and human rights takes a firmer root, the health economists are also taking disabilities into considerations as they have coined an assessment tool called DALY or disability adjusted life years. Therefore the consideration by medical educationists in developing a curriculum to teach and adequately train future doctors for the care of disabled people is a highly commendable act. It has now acquired a totally independent status as a faulty in its own right.

Then there is the element of health provider. Curriculum designers are required to investigate the needs, roles and requirements of those who provide care to a community. If one gives no consideration to the interests of the health providers, one may end up with a bunch of unhappy servants who may indeed fail to comply with directives, either because of lack of interest or indeed an act of sabotage. It has been seen in many medical schools where the authorities have tried to change the curriculum to bring it into line with global programs, but the faculty and their cohorts have decided to veto it for fear of losing their individual authority or simply fear of job loss. They have therefore opposed the change tooth and nail, as was seen in the senior author's (Zaidi) personal experience of introducing COME at Dow. Patience and deliberate discussions as well the support of higher authorities finally prevailed, as the older generation retired and the young people accepted the change over a period of about 20 years.

No doubt the senior faculty must be respected. They may have found the existing curriculum quite satisfactory, giving adequate outcomes over a period of time. One must discuss with them the good and the bad points of the existing practices and why, if it all, a change is required.

Several factors have to be taken into consideration in designing a curriculum. One must identify the aims and the objectives. This basically means the ways and means to archive a certain goal and objective actual lay is the goal one wants to achieve. Thus they should both be identified; in other words, what measures are to be taken to reach the desired goal. The objectives, of course, have to be quite specific and precise in nature, so as to make it easier to follow certain ways and means to meet the target.

It is worth remembering the organisational structure of a medical school or a university. The curriculum committee has the supreme authority in designing a curriculum. Its implementation may require assistance and help by the administration, but the sole responsibility for the curriculum rests with the curriculum committee.

The individual departments do not and must not control the curriculum committee. Specialists in various subjects are part of the curriculum committee, but the overall charge should remain the chair appointed by the Dean.

The curriculum designers must define the learning outcomes of the whole exercise, so that the student as well as the teacher is clear about the expectations in a given time period.

Learning outcomes are what the students learn if they follow the curriculum successfully (i.e. if they complete the program or unit and pass the assessment). It is good practice to specify the measures a student must focus on to comprehend, understand and explain the reasons of 'why' rather than simply understand the possible answers to 'why'.

One should keep the three learning domains to the fore in the learning objectives. They are: (1) memory and recall, (2) attitude, medical ethics and moral behaviour, and (C) psychomotor skills, i.e. problem solving, which in fact is the main objective of a physician vis-a-vis treatment.

So the learning objectives must be designed keeping all these elements in focus, but mainly concentrating on the skills required to solve the patient's problem. Recall is of course necessary for gathering information in view of the previous experience through reading, learning, remembering, etc. The attitude is a major issue these days. Medical ethics has for the first time become a cognizable subject in its own right, which should be taught formally and inculcated into the physicians/students from early on, so that it becomes a second habit in many ways. The psychomotor skills form part and parcel of teaching and instructional strategies these days in the form of skill laboratories, early exposure of young students to a patient, in the community or a health delivery service, and during the clinical years direct involvement of students in observing the master handle the patients and solve the problems.

Here is a rare example of giving due respect to people with disabilities. It is a study of its own unique nature, hence it is mentioned here so that all educationists may take a lead from it. Symons and colleagues (2009) looked at the fact that the lack of knowledge and skills, just as the negative attitudes towards disabled patients, may adversely affect the services and adversely affect their health outcomes. They designed a study for the specific purpose of the development and initial implementation of an undergraduate curriculum for the care of patients with disabilities.

The authors followed the six-step approach for developing curricula for medical education as described above, covering the elements of general needs assessment, specific needs assessment, defining goals and objectives, determining the educational strategies, planning the implementation, and developing an evaluation plan.

They were successful in inculcating the orientation, awareness and application of knowledge, skills and attitude relevant to patients with special needs, in their innovative curriculum.

They have harnessed both traditional and non-traditional teaching strategies for implementation of a 4-year medical school curriculum. They have also involved a number of academic departments including specialised community-based agencies. They have evaluated the curriculum through an attitudinal survey, administered using a controlled design (pre- and post-exposure to the curriculum).

The authors believe it is too early to see the final results which shall require rather rigorous evaluation of its efficacy in achieving the targeted goals.

There was a time when the world paid no attention to the disabled. However, thanks to awareness, orientation and above all to recognition of human rights, appropriate attention is now being given to people with congenital or acquired disabilities.

Syllabus is like a soul to a curriculum (Toohey 1999; Forsyth 1999). It contains the core of the teaching material and a table or index of the methodology required to achieve the desired goals (D'Andrea 1999). The syllabus should meet certain criteria. It should be comprised of topics relevant to the learning outcomes, and must not be overbearing, unwanted or exhaustive. Anything not meeting the learning outcomes, however exciting, must be avoided, as nothing is worse than a hefty, burgeoning syllabus. It drives both the students and the faculty away from it. Students find solace in looking for short notes and abridged editions, while teachers bypass the bulky syllabus by devising their own notes. Such notes become a matter of life and death for both parties in the course of the academic year. Some teachers rely so heavily on their personal notes that if they lose or misplace them they feel absolutely helpless and handicapped!

The syllabus should be coherent with the needs of the students as well as the community. It is no good teaching subjects they may never be able to employ in their practical life. Or, indeed, omitting those topics that they may see in their community and are not taught. In many developing countries, one major problem is exactly this – that the books are written and authored by Western teachers who have no knowledge of those remote areas which they may have never visited, let alone discussed their diseases. Likewise, many students in the third world may find it difficult to comprehend the meaning of certain terms used only in the West, For instance, anchovy sauce is often quoted as a description of a liver abscess aspiration, so if a student has not seen anchovy sauce he may not understand it fully.

It is important that the syllabus should cover topics on a dynamic basis, harnessing the previous information to build upon fresh stocks of knowledge and skills so that a contemporary syllabus with a futuristic outlook is developed.

Research is the backbone of medicine. Therefore a syllabus must employ current research as its foundation and give the students the benefit of the latest information, encouraging them to investigate issues further and be inquisitive and active learners rather than passive recipients. One must, however, remember that the teaching material should be relevant and not unduly massive as this would adversely affect the students who may simply lose interest in learning with a view to acquiring knowledge, albeit just to pass the exams.

2.1 Traditional and Modern Curricula

Medical education was not considered to be a separate, cognizable entity in the nineteenth century. Britain ruled the world except for the United States of America. Most of Europe had its own medical schools run by such famous universities as

Padua, Venice, Hamburg, Heidelberg, Paris, etc. Vienna certainly had a major influence in many parts of the world. From the Suez Canal through the entire Middle East, Indian subcontinent, Near East, and many countries in the Far East followed the curricula and syllabi developed in Edinburgh, Cambridge, London, Oxford, etc. Hundreds of inventions and an equal number of physicians and surgeons dominated the world scene from the early day of Montpellier, Bologna, Padua and Vienna etc. to the times of William Harvey (1578–1657). He must be credited with the major breakthrough in the science of medicine, through his discovery of blood circulation. He was the most prominent physician at St Bartholomew hospital. He also lectured in anatomy and surgery in around the middle of the nineteenth century. The medical curriculum was designed for 6 years to complete the diploma, and dissection of human cadavers was essential in the preliminary years.

In 1726 a campaign was begun by four renowned physicians in Edinburgh to establish a higher seat of learning. In 1741, an infirmary (where one of the authors, SZ trained) followed by the Edinburgh medical school was founded. Anatomy in those early days was taught by surgeons as a part of their portfolio.

Edinburgh has since been the seat of learning for hundreds of physicians and surgeons who have served many nations on Earth. This city and its sister cities such as Dundee, St Andrews, Aberdeen, Glasgow, etc. have produced the finest teachers and curricula for many parts of the world. The best evidence to support this statement is the example of Professor Harden, who is the pioneer of the latest developments in medical education and curricula such as an integrated curriculum.

The stories of evolution of medical education and teachers are intertwined. John Hunter is one such glowing example. He lived between 1728 and 1793, and must be called the father of modern teaching of anatomy and surgery. The famous John Hunter Museum at the Royal College of Surgeons in Lincoln's Inn in London is visited by a large number of students and teachers from far and wide to pay tribute to the master and to learn more each time they visit.

Finally, we must mention the name of Joseph Lister (1827–1912) who the history of medicine and teaching of surgery by his presence in at the annals of history. He introduced the principles of disinfection, prevention of infection and carbonisation. His antiseptic principles were taught in all medical schools from 1865, and have dominated the scene since. Lister is the father of antiseptic surgery, which is the fundamental brick in the teaching of the art of medicine and surgery across the world.

The world has moved on and the ways we deal with infection control have acquired a social status. Likewise, medical curricula have adopted new format as and fresh looks, but the credit must always go to those early teachers who broke the ice in many fields of medical education.

In 1945, one visionary politician changed the destiny of health care in Britain. His name was Ernest Bevin. He was the son of a Welsh miner, who saw his father die of lack of health care. He became a Labour minister in Attlee's government and brought about a revolution in the form of the National Health Service. Initially it was opposed by the medical profession, tooth and nail, but public opinion soon forced them to cooperate with the government and it became part of a permanent change.

The NHS was basically designed to serve the people of Britain free of class distinction. It was not specifically designed to teach, but, as it grew and services expanded across the length and breadth of the country, it needed more and better trained doctors to meet the growing demand, as indeed did the matching technology developments. So the early surgeons and physicians began imparting education locally in their outpatient clinics, wards, operating rooms, etc. Those were the heydays of the NHS. A consultant and a matron ran a department efficiently and authoritatively. Life was simple, and enjoyable. The houseman was the slave at the time, bossed around by everyone. In the process, however, he learnt the art of medicine in the good old fashioned way of apprenticeship, one to one discussion, and training.

For many years, formal teaching in the NHS was not routine practice. Those who wanted to pursue their careers by acquiring the fellowship or memberships of the Royal colleges were allowed a couple of weeks of study leave to go on a course, either at one of the Royal colleges or to private tutors.

With the changing times and responsibilities, and the expansion of knowledge and technology, many new changes have arisen in the NHS. The famous document release by the GMC called Tomorrow's Doctors and the Calman report have brought about radical changes in medical education and training of young doctors in British hospitals. Formal courses are now regularly run for educating them to meet certain criteria and to pass their certifying exams. Many young doctors join hands at workshops run by different hospitals to develop special skills. Some even take fellowships to Australia, South Africa, USA or elsewhere.

An excellent paper published by Fleming et al. (2014) displays the whole process of postgraduate education currently in vogue in the UK. It duly highlights the point that structured medical training in the UK is relatively new and is still undergoing transformation.

For many years the long working hours at registrar and houseman levels was the norm. This may have been tiring, even frustrating, at times, but it provided them with massive practical, problem solving training. Since the introduction of the European working hours framework, a junior doctor is not supposed to work more than 37 and a half hours per week. It has led to the development of a general perception in some circles that, for surgical training, this limited time period may not be enough to hone the skills required of a lawfully trained surgeon working as a consultant.

Teaching has always been excellent in the British universities and the Royal Colleges. Generations of fine physicians and surgeons have visited the UK since the inception of the NHS to work, train and earn a qualification good enough to get them a top job back home. The Indian subcontinent and the Middle East seem to have benefitted most. As compensation for training and teaching, the NHS has benefitted with an unlimited supply of able hands to cater to the needs of the British public. This symbiosis has stood the test of time, though since 1970s many more have gone to the greener pastures of the North American health services. The major difference noticed by the supplying countries was the significant drop in the number of trained doctors returning home.

The majority of those who went to Britain usually returned home within 4–5 years to serve their own countries, but those who went to the US or Canada hardly ever did.

There were many renowned teachers at the Royal Colleges. One such teacher was David Slome. He taught physiology at the Royal College of Surgeons, London, for many years. One cannot pay adequate homage to that great teacher, who was selfless, dedicated and a master of the art of teaching.

His contemporary teacher in anatomy was R.J. Last, who revolutionized the teaching and learning of anatomy through his book. He had a unique way of teaching this dry subject, an enjoyable and unforgettable experience.

Medical demonstrations have taken a long and troublesome course in history. The stories of body snatchers and dissections carried out by Gray and colleagues had made the teaching of anatomy a major subject. Besides, the insanitary conditions that prevailed in London so aptly depicted by Charles Dickens in his famous novels had brought into focus the pathos which prevailed in cities like London in the previous centuries, including when Europe suffered at the hands of the Plague.

In the nineteenth century, the whole world was struggling to cope with epidemics such as cholera, typhoid, TB, syphilis, malaria, measles, and smallpox, just to name a few.

Doctors were expected to be masters of all the subjects that concerned the living, and indeed be able to perform a post-mortem if asked. Formal teaching through didactic lectures was the standard modality and memory and recall were the modi operandi. However, there was no uniformity in the core content of the subjects.

America was emerging as the future global leader. Its economic powerhouse had begun to shift power from Great Britain to the United States. One of the agendas addressed by the rich and powerful elite of the new powerhouses, such as the Rockefeller Foundation and the Carnegie Foundation, was to streamline professional medical education and training of future doctors.

Therefore a famous educationist by the name of Abraham Flexner was hired to develop the curriculum and syllabus for the future physician and surgeon (Flexner Report 1910). He was given a task with the terms of reference to identify the lacunae and shortcomings in the teaching of physicians. Furthermore, the Carnegie Foundation asked him to develop a plan to produce a multipurpose doctor, who should be able to treat the common cold as efficiently as he would perform a tonsillectomy or an appendectomy or, indeed, perform an autopsy.

The whole purpose of producing a doctor according to Abraham Flexner's terms of reference was to serve the masses, which were mostly rural, hailing from an agro-based economy, or at best industrial services or manufacturing units, etc.

This doctor had to be multipurpose and multitalented, as he was expected to reside in remote areas where he would be the only source of relief and remedy for patients.

Medical schools responded by developing an overloaded syllabus. Each subject acquired an inflated status. This resulted in the teaching of basic and clinical subjects beyond what was necessary, as each subject specialist wanted to make sure that his particular subject did not lag behind other parallel subject or his own position would be compromised. This effort resulted in the dissection of each subject into further sub–subjects, each demanding an equal or better position in the pecking order. Thus an anatomist would leave no stone unturned in teaching the most minute details of anatomy, embryology, histology, cadaver dissection, preparation of slides, etc., so much so that a student was expected to study the most complex elements such as spinal tracts, nuclear pathways, cranial nerves, tiny bodily muscles, ligaments, tendons and minuscule structures, their functions and their pathology. The subject of forensic medicine took up such a major role that a full year was reserved for this subject, which may be little used by an ordinary physician during his whole career.

The three fundamental teaching methods employed in the US during the nineteenth century were:

1. Apprenticeship
2. Proprietary school system
3. University system

Apprenticeship had been the familiar standard teaching modus operandi through the ages. Many other methods were relatively new. Therefore physicians were coming into practice without going through standardised education which caused many concerns to the authorities.

Earlier on the radical changes in medicine had appeared in the fields of surgery and radiology. Carbolisation had been introduced and antiseptic surgery had become the cornerstone of surgery. Pathologists, microbiologists and men like Pasteur had revolutionised the concept of sepsis and wound infection.

There was so much chaos that the American medical association decided to pressurise the government into standardising medical education across the nation. Thus, in 1904 a Council on Medical Education or CME was formed.

This problem greatly upset the American Medical Association, which lobbied the government for a government mandate to standardise American medical education. They sought to restructure or shut down schools that failed to adopt a systematic approach to medical training, or “scientific medicine”. With this goal in view, the AMA created the Council on Medical Education (CME) in 1904 to promote the modernisation of medical education. The following two primary reform initiatives were given as the terms of reference:

1. The standardisation of premed educational requirements
2. An “ideal” medical curriculum, involving 2 years training in laboratory sciences and subsequently 2 years of clinical rotations in a clinical set up, which in those days was the teaching hospitals

CME planned to survey the current state of medical education in the United States and approached the Carnegie Foundation for the Advancement of Teaching. It was then headed by Abraham Abraham Flexner.

Abraham Abraham Flexner is a historical figure who lived between 1866 and 1959. He was unrelated to the medical profession. In fact he was a secondary school teacher in Louisville, Kentucky, later promoted to become the principal. After nearly two decades he went on to graduate studies at Harvard and later on at the University of Berlin, which was the major centre of learning in those days. Abraham Flexner then joined the research staff at the Carnegie Foundation for the Advancement of Teaching. He was given the task of investigating the whole process of medical education in the USA, which he did exceedingly well. His final report is well documented in the annals of the history of medicine. Flexner must be called the first person who developed the first ever 'sciences-based curriculum'.

2.2 The Abraham Flexner Report

Over the course of 18 months, Abraham Flexner visited 155 different US medical schools, looking at the following five major points of interest:

Entrance requirements
The faculty, its training and its size
The cost of education
The status of the laboratories
The associated teaching hospital and its clinical staff

Flexner published his report in 1910, identifying many lacunae and deficiencies in the system, often criticising the teaching set ups as money making machines without giving a quality product. He pointed out: "The overwhelming importance of preventive medicine, sanitation, and public health indicates that in modern life the medical profession is an organ differentiated by society for its highest purposes, not a business to be exploited." "The right of the state to deal with the entire subject in its own interest can assuredly not be gained. The physician is a social instrument."

Flexner's report changed the whole complexion of the game, as radical reforms were implemented in the admission criteria and indeed in the curriculum. As a result of these reforms the licensing boards created the Federation of State Medical Boards in 1912 for accreditation of medical qualifications.

Not everything was positive about the Flexner report though, as many underfunded and under privileged medical schools closed down, mainly depriving the black community of accessing medical careers and causing a decline in the availability of medical service. Out of a total of 126 medical schools, only 96 survived, leading to further fall in a couple of decades to only 76. All but two black schools closed down, further depriving the underserved communities of any form of health care and education of those privileged to pursue a medical career. This damage has remained unrepaired and communities continue to suffer, despite the racial reforms of the 1960s.

Only now (2013–2014) that the Obama health plan seems to be gaining ground is it expected that approximately 34 million Americans who have no health insurance, and hence no planned health care, will be included. The majority of them are African Americans and Latinos. So Abraham Flexner may have caused serious damage to medical care in America with his much applauded report all those years ago; however, he also reformed and streamlined the process of medical education on a scientific basis.

Many workers have appreciated as well as criticised the Flexner curriculum. One such group believed that, while firmly grounded in Abraham Flexner's legacy of ideas, today's medical curriculum, as both an entity and a process, has become more and more complex.

They go on to identify in their paper, the key elements required to give due credibility to a curriculum. They are:

1. Expected competencies and roles
2. The learners at the centre of the enterprise
3. Assessment linking competencies and learners
4. The conditions and resources for learning
5. A multifaceted socio-politico-cultural context in which the learning occurs

These writers have also noted salient developments during the last century, such as those in the disciplines of curriculum studies, cognitive psychology and organisational strategies. The institutions have also adopted and agreed to change and modify according to the needs of time their habits and practical applications in better understanding and better application of curricular changes over time.

This paper, written by Bordage and Harris (2011), offers very sensible and hands-on advice to curriculum developers, such as:

1. While focusing reform and innovation on specific elements of the curriculum, consider how those elements affect other elements and vice versa, in positive and negative ways
2. While grounding the reform or innovation in sound conceptual frameworks, seize any opportunities to formulate a research agenda which can build upon and advance our understanding of curricular innovations
3. Moving beyond considering the curriculum as an entity, use deliberative and leadership processes that can lead to enduring curriculum reform

Some of these pieces of advice are thoroughly practical and noteworthy, others require further brainstorming. For instance, it is easy to say than actually practice the concept of formulating research to further the knowledge about curricula, and their advancement may not be possible in all centres. Undoubtedly it should be the objective of an educationist, but many resources are required for specified research and, regrettably, medical education is never at the top of the agenda in a university set-up. There are more pressing projects such as research on cancer or CVS disease.

2.3 McMaster Philosophy

The year 1966 may safely be called a watershed year when the masterminds of McMaster university achieved a dream. It revolved around the concept of revolutionising medical education, by challenging the traditional curriculum which has been the gold standard in many universities for over five decades. They launched a program based upon the 'McMaster philosophy'. It involved highly innovative ideas which were not just radical but unheard of. This philosophy called for the education of young medical students through an integrated curriculum, instructed through problem-based learning, encouraging critical thinking, active student-centred learning, small group discussion, diagnostic evaluation and early exposure of students to clinical scenarios.

Nuffield and Barrow (1974) performed groundbreaking work and developed strategies which were due to become extremely popular over successive decades. Many new developments have since happened in this philosophy, but the paradigm shift from the Flexner curriculum, i.e. from an overloaded, didactic, lecture-based, purely cognitive teaching methodology to student-centred small group discussions, merger of clinical and basic sciences, etc. remains the dominant feature.

The innovative method called PBL (Problem Based Learning) introduced by McMaster is so important that it is discussed at length later in its own chapter.

After careful planning, the first batch in this hitherto inexperienced avenue of teaching was admitted in 1969. The first ever curriculum based upon PBL philosophy involved a radical shift from traditional curricula. It was based upon the principles of self directed small group discussions, inculcating the habit of intellectual exercise, critical thinking, synthesis, analysis and problem solving, etc.

Since curriculum designing is a dynamic activity, the masters noted that there was a need for a change after a few years, and kept a close watch on the McMaster philosophy of lifelong learning, with critical thinking and problem solving. The last revision was in 2005.

The third change was christened with the mnemonic COMPASS. Its full form is Concept-oriented, multidisciplinary, problem-based, practice for transfer, simulations in clerkship, streaming.

Since the inception of the original curriculum in 1969, there have been two major curriculum revisions, the most recent of which was in 2005. The original curriculum attempted to integrate both basic science and clinical science into biomedical problems. The second iteration of the curriculum focused on priority health problems and centred on a list of common medical problems as the foundation for curriculum organisation, on the basis that an understanding of the management of common conditions included areas of knowledge essential for clinical competence. Under the third, current curriculum, the COMPASS model was adopted. Under this concept-based system, emphasis is placed on underscoring the underlying concepts in the curriculum with a logical sequencing of both the concepts and the body systems. An article by Neville and Norman (2007) briefly reviews the history of the development of the undergraduate MD program at McMaster and the three curricula that have been developed during the past three decades.

The McMaster philosophy was based on the principles of the knowledge and skills required to solve the biological, behavioural, and population health issues. It also identified those common conditions, that it was thought a physician should know. It is so pertinent that if a physician knows all the syllabus but does not know the actual diseases seen in his community or where he practices, the knowledge becomes superfluous. For instance, a medical student in Africa must know about malaria, and HIV. He may not know about many other conditions written about in medical textbooks, but he must not ignore those relevant to his workplace. This was one major drawback of the traditional curriculum, where the teachers would deliver massive lectures in totally alien topics, just because the book contained them, with the result that there was an overburdened student with a plethora of knowledge which he might never use.

McMaster took the lead in tailoring the curriculum to match the needs, incorporating the fundamental biological, biochemical, path physiological facts, and discarding a lot of unwanted information. Also included were behavioural sciences and ethics as an integral part of the curricula. Both these elements had been either sidetracked or simply ignored in the Abraham Flexner era. Moral issues were definitely less potent in the early days, but have now become a nightmare for a physician, not conversant with the normative and applied principles of ethics in medicine.

They have learnt lessons and transferred the knowledge to other global institutions. COMPASS is a fine example of modern teaching methodology as it is web-based and accessible to all the institutions linked to the mother campus of McMaster. Besides long and boring extended versions, objective problems carefully written have been trimmed to size and made more pertinent to the learning objectives.

At the revolutionary introduction of PBL, didactic lectures were discarded, even condemned. However, they have now been partly reinstated in the form of short introductory lectures, dedicated to the relevant problem. It not only bridges the gap in knowledge, but also fills the vacuum left in the PBL exercise.

We believe it to be a very productive idea, and should pave the way for further development of similar strategies elsewhere.

We have observed that mature students do well in PBL, but those who come straight after high school struggle somewhat. A brief introductory lecture is always helpful – it makes newcomers feel at ease.

McMaster has been leading the world of medical education for many decades and appears to be gaining further recognition as the models are being replicated in many global centres.

Many major centres such as the University of Limbergh in Holland have adopted and modified it to suit their needs.

Maastricht University in Holland has developed its own PBL strategy. It has gained huge popularity as Maastricht becomes a major centre for medical education. Here is an illustration of an extremely popular practice.

2.4 PBL Steps Following Maastricht Methodology

The group meets and chooses a scribe to note down each activity. Each member of the group must actively participate.

Step 1. Identify and clarify unfamiliar terms given in the case scenario. Note down the terms requiring further explanation.

Step 2. Elaborate the problem by defining the issues identified by the students. The scribe notes down the identified problems.

Step 3. Brainstorming. To discuss the issues and problems, identifying the possible solutions based upon existing knowledge. The group of students learn from each other by sharing knowledge, which is recorded by the scribe on the flip chart or the board.

Step 4. Review/revisit the previous steps and elaborate further by discussing possible solutions, which are noted in an orderly fashion by the scribe.

Step 5. Identify learning objectives with consensus. The facilitator keeps the discussion focused.

Step 6. Self study.

Step 7. Group discussion. Sharing information duly gathered, identifying learning resources duly commended by the facilitator if required. The facilitator also checks the results of the whole group activity.

2.5 Community Orientated Medical Education

Pakistan has deep and historical connections with the Arabs, Persians and Turks. Anthropologically speaking, the Pakistanis are a conglomeration of Scytho-Dravidians, Skahas, Indo-Aryan, Turko-Iranian and Arab-Afghan bloodlines. There are a few niche races too, such as the Hazaras, of possibly Tibet-China roots and Makranis, possibly of Tanzanian origin. Most Pakistanis trace their roots to the Arab lands, often claiming to be heirs to the past Muslim glories. Pakistan came into being on the basis of the clear identity of Muslims from Hindus.

Muslim physicians in Pakistan, alias Hakims, proudly trace the roots of their knowledge of medicine and apothecary science to *Eunan*, i.e. Greece. Thus they call themselves Specialists in Tibbe Eunani. It has been Islamicised now to Tibbe Islami, inheriting all the contributions made by illustrious Muslim physicians, scientists and educationists from the seventh century up to the modern era.

Jim Al-Khalili is a contemporary British scientist of significant repute. He is also half Arab, as his father was an Iraqi. By his own confession in his wonderful book called 'Arab and Muslim Scientists', he is an atheist, though of Shia descent. His contribution to world literature vis-a-vis scientists in the Middle Ages cannot be praised enough. It is simply the most informative. For instance, who would know that the hours are divided into 60 min and each minute into 60 s, based upon the ancient mathematical formula of measurement of time invented by the Babylonians, a region to which he traces his roots. Or indeed the fact that zero or *sifar* was known to the Brahmins in India who often travelled to the Arab world for trade and scholarship, thus giving the unit of zero to Arab scientists and scholars. The problems that Ptolemy and Euclid could not solve were easily solved by Arab and Muslim scholars like Al-Khwarzimi and Al-Khayam.

Aristotle has written a lot on biology and medicine, though these works are overshadowed by his other works, particularly ethics, metaphysics and logic. During the reign of Mamun Al-Rasheed, considerable volumes of Aristotelian works were translated by Muslims, both of Arab and Ajm descent. Later on most of these translations became the source of enlightenment of Europe. St. Thomas Aquinas is credited as having translated the Arab works into Latin and after La Conquesta, the decline of Moors in Spain, all that information was made available to the latter day thinkers of the West. Thus the Muslim contribution to science, medicine, philosophy, physics and mathematics is huge, bridging the gap between the period after the decline of the Athenian greats and the period of Reformation, Copernicus and Galileo.

Amongst the great Muslim physicians one must recall the contribution of Avicenna, whose works, called the Canon of Medicine, was the only trustworthy encyclopaedia of medicine taught in such universities as Padua and Paris until the sixteenth century. Many modern day words used in medicine are of Arabic roots, such as alkali, syrup, sorbet, alcohol, alchemy, etc. Not all Arab physicians were Muslims though, as many great Jewish physicians like Maimonides lived, worked and flourished under the tutelage of Muslim rulers.

In the early part of the tenth century, one man alone changed the whole concept of experimentation with chemicals, and elements. He was Jaber Ibne Hayan, alias Geber, who was a pupil of Imam Jafar al-Sadiq, the 6th Imam, and a great-great-grandson of Prophet Mohammad. Jaber introduced chemistry to the world and taught his disciples the fundamental principles of chemistry and alchemy in his laboratories in Medina and later on in Koofa. In his treatise, Jaber describes how he was taught by Imam al-Sadiq himself. He said that his teacher whom he calls the ‘mine of wisdom’ will give him an exercise in chemistry. And when Jaber would return to his teacher with the results, the Imam would either accept them or reject them, instructing Jaber to repeat it, until the correct answer was found. Thus a personal and individual teaching and tutorship based upon the employment of a skill laboratory was the order of the day. To say that the skill laboratories are the inventions of modern education is certainly an overstatement. The principle was always there, albeit updated in keeping with the times, in today’s world, one might add!

Rhazes was one of the top scientists of the Muslim era. His name was Bu Bakr Mohammad Ibne Zakariya (860–932 A.D.). He was born in Rai, in Persia, so he was Persian by descent. He was a philosopher and a superb musical maestro, but he was also the finest physician of his time. He practiced in Baghdad, which was the capital of the Islamic sultanate. He is credited to have differentiated between smallpox and measles, both great killers of the time. He studied medicine in Ray and later on in Bokhra, but continued to improve his educational prowess in Baghdad, through informal education and writing. He wrote more than 150 medical documents. His pursuit of knowledge was not confined to educating himself but also to transferring knowledge and skills to many of his disciples. His love of dissemination of medical knowledge took his reputation beyond the borders of Persia and Baghdad, as the Muslim empire had expanded beyond Bosphorus and Byzantium. His immense contribution to medical education is his monumental document called the ‘El Hawi’. It is an encyclopaedia of medicine which was translated into Latin and English, and was a great source of education, referencing and documentation for all physicians of his time. He is acknowledged to have been a great teacher, a physician par excellence and a man of great depth and poise. He followed the Greek and Hippocratic medicine and believed in clinical diagnosis and herbal treatment. He taught his many students the art of distillation and alchemy of herbs in his laboratory.

Avicenna, or Abu Ali al-Hussain Ibne Abdullah Ibne Sina (A.D. 980–1037) was the best physician of the Muslim world. He was also Persian and a globetrotter. His monumental work called ‘Al-Qanoon fil Tibb’ or the canon of medicine consisted of five books, harnessing knowledge from Aristotle in Philosophy and from Galen in Medicine to supplement, modify and introduce his own concepts and principles of medical care and its teaching. This book was taught throughout the Muslim world as well as parts of Europe. It was the standard reference book in medicine for students of Montpellier until the middle of the seventeenth century.

Avicenna had many students and disciples who were taught through a process of discussion and debate. Surely he must have also employed didactic lectures as was customary then, as it is now, in the field of medical education. Islam grants the greatest importance to personal and communal hygiene, which seems to have dominated Avicenna’s writings.

Europe noted the impact of Muslim physicians through the Moors. Many famous surgeons appear on the scene in the tenth century and onwards. Albacusis of Cordoba was one such great name. He lived in Cordoba or Qurtuba (936–1013 A.D.) and served the university and the hospital in that city of learning. Cordova was a centre of medical learning, with 50 hospitals and 200,000 volumes in the libraries of its university, which was founded in the eighth century (p 93, Arabian medicine).

Avenzoar (1091–1162 A.D.) was another famous surgeon of Moorish Spain. His book called Al-Thesir had a huge influence on Europe. He is credited to be the first to have suggested that a patient with oesophageal stricture might be fed with a nutrient enema (pp 94).

One of the greatest physicians of Moorish Spain was a Jew by the name of Moses bin Maimon alias Maimonides (1135–1204 A.D.). He was a great teacher who taught not only in Cordova but later on also in Cairo. His major influence was in promoting the principles of therapeutics based upon symptoms rather than on astrology or mythology, as some of his colleagues did.

Andalusia or Moorish Spain was a great seat of learning in many fields, but mainly medicine and surgery. However, Muslims had also established massive centres of medical care and teaching in Jundishpur, Baghdad and Cairo. Mansur hospital in Baghdad had already started isolating male and female wards, and day care surgery particularly for eye diseases. In fact, stories of the selection of sites for building hospitals based upon the decay of dead animals Marat hung in different parts of Baghdad is well known to most historians. If the meat stayed fresh for a sufficient number of days the place was considered to be free of air pollution and thus healthy and free of disease.

All these hospitals had excellent teaching staff with many students travelling from far and wide to learn the art of medicine from the masters, stretching from the deserts of Nejd, to Ninnehav and Damascus to Granada and Cordova. The glory of

Islamic teaching lasted until 1492, when the last Muslim ruler of Granada was expelled by Richard and Isabella, also leading to the Jewish Diaspora. Eastern and Central Europe gave them shelter and benefitted from their genius.

Pakistani Muslims claim to be heirs to the medical teachers mentioned above. The Ministry of Health, Government of Sindh, Pakistan, appointed Zaidi (author) as the founding chair of department medical education at Dow Medical College, Karachi, in 1995. He was also made the chair of a WHO task force to investigate the current situation of medical teaching in Sindh and to train the faculty in designing a curriculum based upon the philosophy of Community Orientated Medical Education.

It was a major challenge. Not just that the concept was new but also the fact that it was still under trial in some countries in the developing world for only the last 4–5 years. Most Indo-Pak medical institutions had inherited their curricula and teaching strategies from the mother country, i.e. Britain, from which they had gained independence in 1947. So the first batch of teachers who trained in British India still controlled the destiny of medical education in many top universities. They were a wonderful bunch of physicians and surgeons, but not necessarily excellent teachers. It was customary until very recently that, if you returned home with an FRCS or an MRCP from UK and joined the medical faculty as an assistant professor, a deaf to position, you automatically became a teacher. There was no formal training, nor indeed any requirement for you to fulfil, to be called a teacher per se. Because all teaching hospitals were part of a medical college, your job was primarily at the college, hence an asset for an associate professor with the status of an honorary surgeon at the affiliated hospital.

It was in the late 1970s when a couple of visionary teachers pointed out the fundamental flaw to the higher authorities and launched the first ever medical education workshops at the College of Physicians and Surgeons in Karachi.

A renowned anatomist turned surgeon by the name of MAH Siddiqui was a Professor of Surgery at Dow Medical College Karachi. He had taught for many years in Lucknow in British India before opting for Pakistan in 1947. This man saw the future of postgraduate studied in the local environment as, by 1958, Pakistan had sustained its first marshal law, making the movement of most citizens to UK exceedingly difficult. So he capitalised on his seniority and, with the blessings of an army General by the name of General Burki, laid the foundation of the College of Physicians and Surgeons in 1966–1967 at Karachi. He and his team worked night and day to establish this centre for post graduation. Shabih Zaidi (author) was Professor Siddiqui's house surgeon and often performed minor chores for his mentor during those early days of the college, when its office was located in the side rooms of Surgical Unit 1 at the Civil Hospital, Karachi. It has now grown into a globally renowned institution. Some 30 years later, Zaidi became the founding editor of the Journal of College of Physicians and Surgeons along with Shahida Zaidi. That journal is now indexed and stores invaluable research dissertations by generations of students obtaining their college fellowships.

Two of its pioneering teachers must be credited with introducing the concept of medical education in Pakistan.

Fazle Elahi and Naeem Jafri must be duly respected for their visionary approach in highlighting the fact that a teacher in a medical college must be formally trained to be a teacher and not become one by virtue of the title of the job. They pioneered medical education in Pakistan, followed by a large number of teachers and students who joined in.

So in 1995, the first meeting was held at Dow to introduce the new approach. As expected, there was enormous opposition to the whole concept of change. Some senior faculty members not only became abusive but actually walked out, blaming the project director for destroying the very fabric of medical education.

This was understandable as change is always challenging, demanding and often quite difficult. People who had never travelled abroad were the strongest opponents as they felt threatened by the possible exposure of their shortcomings.

In 1998–1999 the WHO hired a capable medical educationist by the name of Bashir Hammad as an advisor and consultant to the Govt of Pakistan in developing the COME project. He was an extremely hardworking, dedicated, seasoned professor, who actually sowed the seeds of COME in Pakistan and instructed many in the art of CBE and PBL. As a pilot project four medical colleges in Pakistan were selected in 1995 to train the faculty in designing a COME curriculum. Shabih Zaidi was made the founding Chair of the department of Medical Education at Dow Medical, Karachi. It was his alma mater and gave him real joy in doing something worthwhile.

The faculty was energised through a series of workshops, conducted by many renowned teachers. Over 200 educational workshops were held between1995 and 2001. Dow became a lighthouse for other colleges in the country to follow. Despite the lack of enthusiasm on the part of the senior faculty, the department of medical education was able to generate enough interest and excitement amongst the younger members, and a prototype of the COME curriculum was developed. Of course, as happens in many developing countries, bureaucracy took the whole project into its own hands, appointing someone well connected in the echelon of the government, Dow Medical lost its vigour and stamina. Bashir Hammad and his associates, however, prepared an excellent portfolio consisting of steps to launch COME and the ways of applying it in a basic health unit, horizontally and vertically integrating the subjects. His efforts are simply the best and deserve due recognition. The report was presented by an official representative on behalf of all medical colleges to the President of Pakistan. A few papers (Baig and Akram 2006) were published, and officials duly celebrated the success. Life moved on.

Various forms of community related curricula have since become popular in many countries. PBL is gradually being employed in different universities in developing countries. Kiguli-Malwadde's example of its application in CBE in Uganda is of interest here (Kiguli-Malwadde et al. 2006).

The authors mention that the Faculty of Medicine (FOM) of Makerere University Kampala was started in 1924 and has been running a traditional curriculum for 79 years. A few years ago it embarked on changing its curriculum from traditional to Problem Based Learning (PBL) and Community Based Education and Service (COBES) as well as early clinical exposure. This curriculum has been implemented since the academic year 2003/2004. The study was carried out to describe the steps taken to change and implement the curriculum at the Faculty of Medicine, Makerere University Kampala.

To describe the steps taken to change and implement the new curriculum at the Faculty of Medicine, the authors describe the various stages, e.g.: characterization of Uganda's health status, analysis of government policy, analysis of old curriculum, needs assessment, adoption of new model (SPICES), workshop/retreats for faculty sensitization, incremental development of programs by faculty and implementation of the new curriculum. The faculty successfully embarked on curriculum change. The authors agreed that it had not been without challenges. However, challenges had been taken on and handled as they arose and this has led to the implementation of the new curriculum. This study confirms that problem-based learning can be adopted even in a low resourced country such as Uganda, and in an innovative way too.

Several years later, when Dow College was chartered to become a medical university by the Governor of Sindh, an old student of Dow was appointed, and a vice chancellor, also a student of Dow, things began to take shape. The tiny sapling of a medical education department planted in 1995 was now a fully blossoming tree, serving thousands of students of Dow University with an integrated curriculum based upon the required systems and integrated both horizontally and vertically. Regrettably, COME could not become a reality, but its fallout and the huge academic activity in those formative years have borne fruit after many years.

The same university has now become a world leader in medical education. The undermentioned publication is an example of the progress Dow University has made in the last few years.

This paper was authored by Jawaid and Ashraf (2012). It looks at the most innovative ways of disseminating knowledge through the latest technological advancement. The authors describe the course development and student perception of the eLearning Research module for undergraduate medical students. It describes the experience gathered in a short span of time, duly demonstrating the relevance of modern technology in teaching many pupils across its many campuses. In December 2011 and January 2012, Dow University of Health Sciences (DUHS) started the first 6-weeks eLearning Module of Research Methodology for the first semester MBBS students. All university campuses have digital libraries equipped with computers with networking and internet facility. 'Articulate Studio 09' was used to made flash-based presentations with interactions followed by assessment with the use of kwik surveys. Student perception was evaluated after each session by quantitative and qualitative methods.

The authors mention that a cohort of 539 students from 3 colleges affiliated with DUHS completed the evaluation Form. Most of the students (93.1 %) rated the overall layout of eLearning module highly. Text of the module was found to be clear and informative by 81.1%. Contents were judged as not according to student's level of understanding by 34.5 %. Overall experience of the first session was rated excellent by 23 % and good by 64 % with a cumulative 87.2 %. However, students had mixed opinions about the requirements of their computer skills for this eLearning module. Qualitative evaluation showed very good experience of students and they want more topics to be covered with this modality.

This brief study proved to be a good experience for the teaching faculty regarding eLearning instructional design and its execution, and was also rated very highly by the students.

The researchers thought and hoped their experience would be helpful for other institutions and medical schools to follow, experiment with and apply.

Computers are rapidly changing our world. Steve Jobs, the founder of Apple, said that even computers are now outdated as the tablets have taken over. It may be true, as the virus that so often hits computers is not yet known to hit the iPad. Who knows for how long?.

The Dow University of Health Sciences is keeping up to date with technological developments, and e-learning, the use of Webinars, Skype, and satellite learning are cost effective and highly productive ways of imparting education. In fact, distance learning and the concept of online universities has now become a reality. Virtual teaching through simulation, as well as interactive learning, is common in most British centres as well as in many US universities.

Donald et al. (2013) compliment the role of e-learning as excellent, innovative and state-of-the-art for imparting medical education to distant regions in this study. They discussed that, in the wake of the Affordable Care Act (ACA), it is imperative that medical education includes formal study of health policy (HP). Many of the new initiatives depend on physician understanding of HP for implementation to ensure delivery of cost-effective, safe, and comprehensive health care to patients. The curricula vary widely across medical schools, and many schools lack any formal education in health planning. Only 30 % of medical schools have a department or institute of HP within their university, and students consistently report a desire for more HP education. Experts emphasise the importance of a standardised HP curriculum as a fundamental component of medical education, based on four core concepts: (1) systems and principles, (2) quality and safety, (3) value and equity, and (4) politics and law.

Donald and colleagues rightly claim that online self-directed learning is an effective instructional method which can bring curricula to schools without investing in additional resources or infrastructure, including the potential to satisfy the need for standardisation of HP education and provide a convenient and efficient means to reach students across the country.

They designed a curriculum consisting of web-based modules. Following evaluation of the piloted curriculum on George Washington University (GWU) HP track students, Donald et al. expected this online curriculum to be shared online and made available for undergraduate, graduate, and continuing medical education at other institutions.

The founding unit of Medical Education at Dow Medical College, had a major role to play. Some of these roles are mentioned above. One major role of a department of medical education is to train the trainers. It is an art which takes awhile to inculcate. Once fully developed, a department can play the part of a nursery producing crop after crop of teachers and trainers.

Steinert and colleagues (2013) describe a year-long faculty development initiative to develop leaders in medical education. The Teaching Scholars Program for Educators in the Health Sciences at McGill University enables faculty to improve their educational knowledge and skills while maintaining their clinical, teaching, and research responsibilities. The program, tailored to the participant's individual needs, consists of five main components:

1. Two university courses
2. Independent study
3. Participation in faculty-wide faculty development workshops and medical education rounds
4. A monthly seminar
5. Attendance at a national or international conference or course

The authors describe hoe, since its inception in 1997, 22 faculty members had completed the program, with a few more to complete soon. In their report they discuss the experience of 15 scholars who had completed the program by September 2000. The authors thought there were indications on evaluation that the scholars achieved most of their stated objectives. The courses provided a foundation in educational principles and methodology. Besides, independent study allowed them to work on educational projects relevant to their disciplines. Then there were monthly seminars, faculty development workshops and outside courses which offered opportunities for skill acquisition and reflection.

The writers had reasons to believe that the attendants also appreciated the opportunity to have social interaction with peers and colleagues with similar interests. An essential fall-out was that the participants became aware of available educational resources, which they could, obviously, harness in their practical life, in due course. The study noted a major benefit of the program when it was found that, 1 year after completing the program, many had joined new educational committees, taken on new leadership roles in medical education, and developed new courses for students and residents.

What was more interesting was the finding that some of their projects had been presented at national meetings and awaited publication. Two scholars, who attended this program, had pursued further study at a master's level, thus highlighting the impact of a good program on an academic mind. The authors believe that, despite the ongoing challenge of protecting time for educational pursuits, this program proved to be a considerable advantage in helping to develop educational leaders in the Faculty of Medicine – and that is a huge achievement. One tutor, one facilitator, one teacher can change the world.

Gruppen and colleagues carried out a similar study in the University of Michigan. Their medical school is acclaimed as one of the best. It runs a program called The Medical Education Scholars Program (MESP), designed to develop leaders in medical education. The program's goals are to enable faculty to provide curriculum direction, improved teaching, educational research, and development, and institutional leadership at all levels of medical education. It is a 1 year program employing a variety of educational tools and provides a broad curriculum in educational theory, assessment and evaluation, research design and methods, teaching-skills development, and educational leadership.

The authors describe the enrolment of the faculty which is competitive. They measured the major outcomes of the program such as promotions, educational research and development, curriculum leadership, and educational scholarship.

The researchers noted that there were marked improvement in promotions and educational awards, new educational responsibilities, and new educational programs. It was also noted with considerable enthusiasm that there was the emergence of educational scholarship in the professional portfolios of the program scholars in the form of peer-reviewed presentations and publications and educational grant funding.

One must agree with the observation made by Gruppen et al. (2003) through this study that intensive faculty development programs can have a major impact on the careers of the participants and the institutional environment. That is one major role of a department of medical education. In fact, most universities have very powerful educational departments, engaged in producing the finest of teachers, tutors, facilitators and trainers. Many universities have global exchange programs for international collaboration and shared experience. Such programs are of immense value in developing countries.

The old concept that those who can, do and those who can't, teach is based upon an erroneous perception. Even a person with the highest qualifications, with a portfolio of excellent knowledge and skills, may not be able to impart education as effectively as a relatively less qualified but properly trained teacher. To be a teacher one must know the theories and principles of learning before one can teach. That is why teaching goes hand in hand with learning.

Many old fashioned medical colleges still continue to use untrained teachers, which is not only unfair from the pupils' point of view but also tough on the part of the employees to do something for which they are not trained. They may be the best physicians and surgeons, but not necessarily good teachers.

This study (Steinert et al. 2005) duly highlights the recent emphasis on the teaching and evaluation of professionalism for medical students and residents which has placed significant demands on medicine's educational institutions. The traditional method of transmitting professional values by role modelling is no longer adequate, and professionalism must be taught explicitly and evaluated effectively. The authors are absolutely correct in identifying that many faculty members do not possess the requisite knowledge and skills to teach this content area. They therefore believe, correctly, that faculty development is required.

They designed a program for a systematic, integrated faculty development to support the teaching and evaluation of professionalism. The programme consisted of think tanks to promote consensus and "buy-in", and workshops to convey core content, examine teaching strategies and evaluation methods, and promote reflection and self-awareness.

The authors discuss how the program was evaluated using a CIPP (context, input, process, product). Faculty participation resulted in agreement on the cognitive base and attributes of professionalism, consensus on the importance of teaching and evaluating professionalism, and self-reported changes in teaching practices. This initiative also led to the development of new methods of evaluation, site-specific activities and curriculum change.

In their view, a faculty development program designed to support the teaching and evaluation of professionalism can lead to self-reported changes in teaching and practice as well as new educational initiatives. It can also help to develop more knowledgeable faculty members, who will, it is hoped, become more effective role models.

No doubt it is an extremely productive and practical study. Most institutions have an active medical education department. It is a major task of such a department to train and instruct the faculty with a view to cultivate teachers who can produce the finest doctors for future years (Race 2001).

Teaching is an art. One has to have the basic instinct to teach. It is then a personal effort to nurture that talent through a lifelong learning process, attending workshops, and seeking knowledge from those who possess it, but above all, applying it in daily life to hone it. The best way to learn is to teach!

The department of medical education has the major task of continuing the faculty development, as was proven in the following study, conducted by Gozu et al. (2008). These authors agree with our practice and the recommendation that there is an ongoing need for curriculum development (CD) in medical education. However, only a minority of medical teaching institutions provide faculty development in the field of curriculum development. Their study evaluated the long-term impact of a longitudinal program in curriculum development. They surveyed eight cohorts of participants ($n = 64$) and non-participants ($n = 64$) from 1988 to 1996 at baseline and at 6–13 years after completion of a 10-month, half-day per week program offered annually, which included a mentored project, workshops on its steps, a final paper and a presentation.

Fifty-eight participants (91 %) and 50 non-participants (78 %) returned completed follow-up surveys. In analyses, controlling for background characteristics and baseline self-rated proficiencies, participants were more likely than non-participants at follow-up to report having developed and implemented curricula in the past 5 years (65.5 % vs 43.7 %; odds ratio [OR] 2.41, 95 % confidence interval [CI] 1.03–5.66), to report having performed needs assessment when planning a curriculum (86.1 % vs 58.8 %; OR 5.59, 95 % CI 1.20–25.92), and to rate themselves highly in developing (OR 3.57, 95 % CI 1.36–9.39), implementing (OR 3.04, 95 % CI 1.16–7.93) and evaluating (OR 2.74, 95 % CI 1.10–6.84) curricula. At follow-up, 86.2 % of participants reported that the curriculum development program had made a moderate or great impact on their professional careers. Responses to an open-ended question on the impact confirmed continued involvement in this work, confidence in skills, application of those skills and knowledge beyond the field of curriculum development, improved time management and lasting relationships formed because of the program.

This study showed that a longitudinal faculty development program which engages and supports faculty in real curriculum development work can have long-lasting impact.

It is not easy to maintain high standards in the field of curriculum development unless an energetic faculty is duly energized by a potent department of medical education.

The requirements for medical education have changed over the years. With the advent of modern information technology, easy access to massive amounts of information and re-emergence of medical ethics, a whole plethora of demands have cropped up in contemporary medical education. For instance, the incorporation of EBM by itself has changed the whole practice of applied medicine. Likewise, subjects like epidemiology, biostatistics, medical writing, communication skills, and the macro- as well as micro-economy of health care and its impact on decision making have all become essential contributors to modern medical education.

Another major shift seen in medical education is that it has become more focused, structured, and directed towards patient care. It is a paradigm shift from individualistic organ-based pathophysiological teaching to a holistic approach, based upon numerous factors. They are not just related to the physical anatomy of an individual, but also his habits and habitats, psycho-social factors, and the common community factors which may have influenced his health.

This is reflected in the radical changes in teaching strategies. The standard practice of teacher-centred teaching has now shifted to student-centred, problem solving methods. That by itself has changed the entire complexion of the game. The principles and practices of teaching and learning have undergone a sea change with these innovative modes. PBL by itself is undergoing transformation each passing day. The subject is discussed separately in this book.

Then the other change affecting medical education is the orientation of health care. It used to be patient-centred, but now more emphasis is put on the individual's health as related to the community. Community oriented or community-based medical education is popular in many developing countries. The author's experience of COME is discussed in this book.

Information is being generated at an amazing speed. No book can remain up to date; even journals become outdated as soon as they are printed. So the modern source of knowledge is the net as it is freely available on all kinds of devices. This whole process of a massive information base has become the initiator of a new phenomenon, which is the fundamental brick of contemporary medical education; it is called active, lifelong learning.

Such proceeds of active lifelong learning are not confined to the theoretical knowledge only. Increasingly, more skill laboratories, workshops and other practical settings are available through the wisdom of modern technology for a pupil to learn new skills and practice them on models and artificial appliances.

One of the new entries in the field of medical education is the quality of leadership which a physician is expected to develop, cultivate and demonstrate in practical life. It is absolutely true that in a remote setting a physician is looked upon as a wise man of the village, perhaps second only to the parson or religious leader. A physician is often required to advise on common community issues. Personal matters are always there for him to sort out, but, combined with social and common communal issues, a physician may be required to lead from the front. So this aspect of teaching has to be included in the curriculum.

Time management and working as team member are also essential for a contemporary physician. Since the field of medicine is becoming increasingly complex, since the demands on physicians are gradually rising, and since there are time restrictions for various reasons such as the European working rules, efficiency with economy of time is an important factor in patient management. Many issues are complex, requiring a team effort. To be an active and productive member of the team is also an essential component. For instance, an MDT is a group activity, where each member has to put in an individual opinion or expertise, but combining with the other members to obtain the best possible outcome for the patient. So to be a useful member, one must be able to compromise, if needed, and be forceful enough without causing stress to others if so required. Playing as a team member is an art which all physicians must possess. To convey your point of view convincingly without upsetting other members is a skill. It is rightly said that knowledgeable people discuss and debate, the ignorant argue!

A massive change noted in modern education is the element of medical ethics which has regained its lost position. It was because of atrocities by the Nazis during the second war, when prisoners were experimented upon without their approval! That has brought back the teaching and learning of the principles and practices of medical ethics. A physician must show empathy, respect, dignity and due honour towards his patient; he should understand the cultural variations, values and beliefs, and duly respect them. Social anthropology is a subject in its own right, which may be taught while imparting education on medical ethics through lecture, PBL and workshops. However, medical ethics is now part of the curriculum.

The need of society, a community or indeed a nation is dependent upon many factors. So the medical educationists would keep these elements in their view, while developing a curriculum. For instance, a primary physician is the backbone of medical service in most countries, and only a limited number is required to specialise in different fields. Likewise, a conundrum may rely heavily upon its academicians, who should be searched out from within the cohorts of a university. So the curriculum should grant that opportunity to the teachers, and indeed the student, to show that particular trait of brilliance. Special Study Modules or a desired elective may be such a window of opportunity for a bright student, who may eventually become a leading research scientist and an academician. A curriculum should allow such leverage to the teachers to help identify talent and encourage maturing.

Since medical education includes basic and clinical sciences, it is important to remember that curriculum needs are best served by integrating both these components in modern education. However, a significant role must be given to clinical application of basic sciences from day one. The clinical part in its own right must also receive a thorough practical application. It should increase the knowledge base as well as applied skills, both quantitatively and qualitatively, improving the problem solving methods at all levels of health care. This training should cover the ambulatory patients in an outpatient department in a teaching hospital as well as a remote outback clinic. It should encompass inpatient training, both medical and surgical, as well as post procedural follow-up. It should inculcate the latest state-of-the-art surgical knowledge of day surgery, keyhole surgery, and know how, at least at the theoretical level of the rapidly emerging robotic surgery.

The curriculum should cover all aspects of clinical training, commensurate with the needs of the society or the targeted population to be served by the physicians of given institutions.

In investigative fields such as radiology and pathology, they must know the latest techniques such as invasive radiology, and the various modalities of biopsies and collection of specimens such as blood and the human tissue.

Certain specialities tend to be forgotten during a school curriculum, which deserve their due place in a course, e.g. epidemiology, biostatistics, molecular sciences, dermatology, ophthalmology otolaryngology, trauma, minor ailments and above all care of the elderly, which is becoming a major issue in many parts of the world.

These guiding principles are mentioned here so that a faculty designing a curriculum may keep these elements in view. Obviously it is neither a complete list nor a binding list for any medical school to follow. The only intention is to help those involved in medical education to learn from our experience. Sharing knowledge is always a joy!

2.6 SPICES

Harden and Laidlaw have described ten points that need to be answered by curriculum designers (pp 65 Harden and Laidlaw 2012).

They have identified such questions as the needs to be met, expected learning outcomes, the content, organization of the content, educational strategies, teaching methods, methods of assessment, methodology of communication of the curriculum, educational environment, and management of the whole process.

These are valid points as any curriculum designer would know. Some are obvious questions such as the core content and educational strategies, others may require brainstorming and communication skills, such as the way the curriculum is to be implemented, overall management of the faculty and students, and the logistics.

SPICES is an acronym used by Harden in defining those parameters that determine the process of education as a whole.

S for Student centred	Teacher centred
P for Problem-based	Information oriented
I for Integrated or inter-professional	Discipline-based
C for Community-based	Hospital-based
E for Elective-driven	Uniform
S for Systematic	Opportunistic

2.6.1 Sequencing and a Spiral Curriculum

Harden and Laidlaw have discussed the role of sequencing and the development of a spiral curriculum in their latest book (Harden and Laidlaw 2012)

They believe that the process of sequencing requires stepwise progress from simple to complex learning objectives, providing general information or principles for a more detailed consideration, and application of basic principles in practice.

They have explained a spiral curriculum in the shape of a paradigm, displaying stepwise progress from learning normal structure, function and behaviour in phase I to the next stage in phase 2 of years 2/3 when abnormal structure function and behaviour not taught. It is followed by the third phase applicable in years 4/5 when the same problem or theme is applied in clinical practice. The final phase is when the knowledge thus gained is applied in the preregistration year as on the job learning exercises.

In their spiral the three well known components of medical education are intermixed all along the pathway.

Harden and Laidlaw (2012) describe how the students progress through the curriculum as seamlessly as possible, transiting imperceptibly between the phases.

2.6.2 Curriculum Mapping

Harden calls it 'Todays' agenda –(Hraden, RM, Laidlaw JM, 2012). Curriculum mapping is the most innovative item on the agenda of modern medical education. It basically means that the stakeholders can keep a track and record of all curricular activities in medical institution. It has many advantages and many beneficiaries.

First of all, curriculum mapping enables a student to design, develop, and implement his own learning strategies. His activities can be monitored by the Dean and the faculty during the course of an academic session. A student-centred mapping employs not just the teaching and learning schedules monitoring but also the aspects of assessment and evaluation. Thus all the components can be monitored from a student's point of view Gozu et al. (2008).

Teacher-centred mapping enables the teacher and the faculty to keep a track record of the teaching during the session, module by module and block by block. So each teacher knows what subject he has covered and what remains to be covered. Besides, the mapping also allows and facilitates the planning of curricular activities, as well as evaluation and assessment, both formative and summative in nature.

Curriculum mapping also help the Deanery in monitoring the activities of both parties, namely the student and the teacher, thereby facilitating the smooth transfer of knowledge and skills during each block. It also avoids repetition of the subjects taught by different faculty members of the same subject.

Deanery can also employ mapping to monitor the activities of a student at different teaching sites of the medical school or the university. Many subjects are taught at different sites, such as community centres, general practice, outpatient clinics, operating rooms and indeed in different laboratories on campus and outside. It is quite difficult to keep track of all the activities of each and every student and the faculty, but mapping ensures active monitoring of all activities can be pursued.

As the students graduate and move up the career pathway, their progress can be monitored through mapping. So, for instance, if a student goes for a residency, his activities can be actively monitored and cross referenced with the supervisors. If he goes on to do a masters or doctorate, mapping can enable the parent Deanery to keep track of his progress and provide help, guidance and support when need. Deaneries have close working relationships across the globe. They can thus help and advise regarding any benefits a student may be given in academic, technical or financial terms.

Interschool migration is a common practice. Some move because they are unhappy with the present set up, others for personal or family reasons. Mapping is an excellent way to help facilitate the transfer of academic records and achievements, etc. from the parent to other centres as and when required.

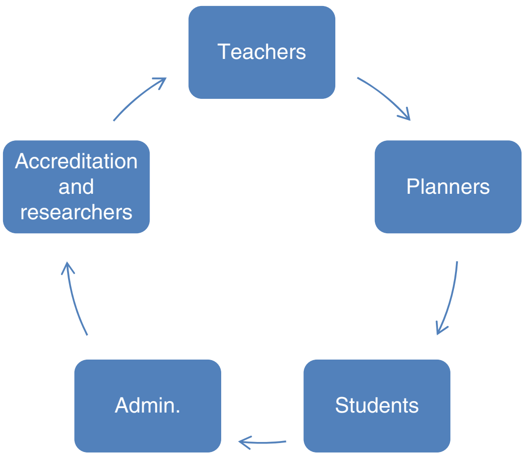
Mapping is also extremely helpful in maintaining the academic record of the stakeholders, for future promotions, or recommendations. Many faculty members move up the ladder over time. Mapping is an excellent way of judging their performance over a period of time.

Here is an illustration of mapping a disease pathway in an integrated curriculum.

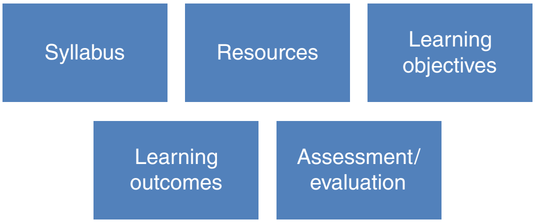
Curriculum Mapping

It displays all elements of a curriculum

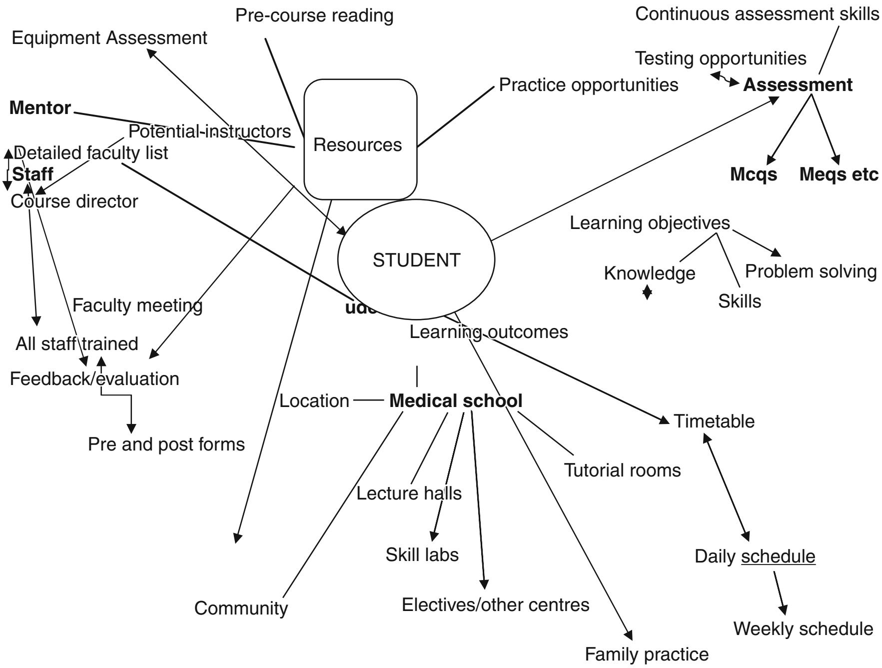
- Contents/syllabus
- Learning objectives
- Teaching strategies
- Learning outcomes
- Educational experience
- Assessment and evaluation



Curriculum Mapping



Curriculum Mapping



Curriculum mapping is constantly being employed in active teaching of an integrated curriculum. Here are a few examples of mapping in an integrated curriculum.

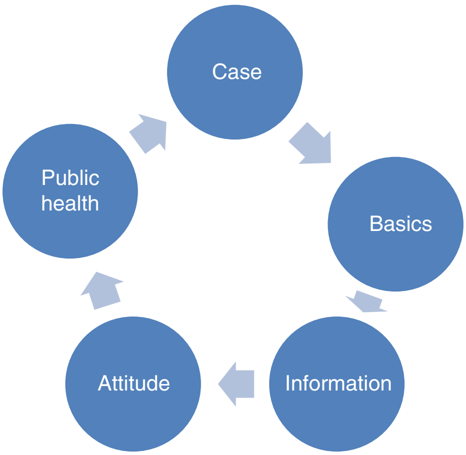
Case Based Scenario

- A 52 yr. old man presented with cough, dyspnoea, wheezing , slight bluish discoloration of his lips and mild koilonychia.
- He has a bag full of inhalers, tablets etc. He also carries a portable oxygen canister with him.
- He is a smoker. He has worked in an Asbestos factory in his early days. Ctd.

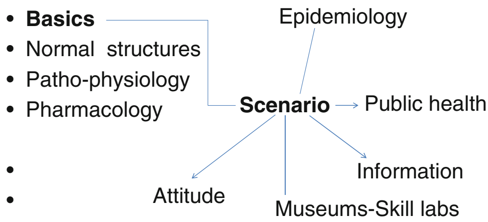
CBS

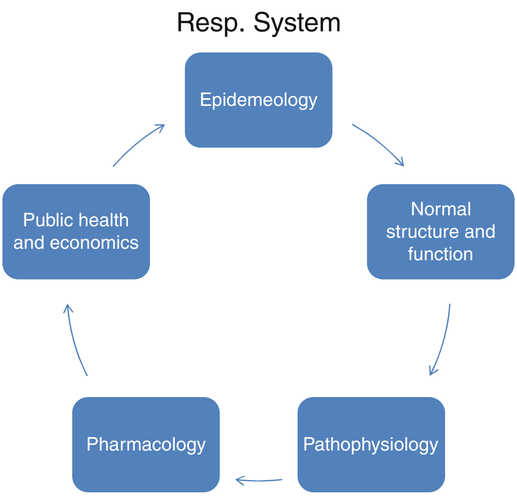
- **Investigations in his notes.**
- Chest x-ray and a CT scan
- Blood picture
- Blood gases
- ECG/ Pulmonary function tests- Spirometry
- Sputum analysis
- Urinalysis etc.

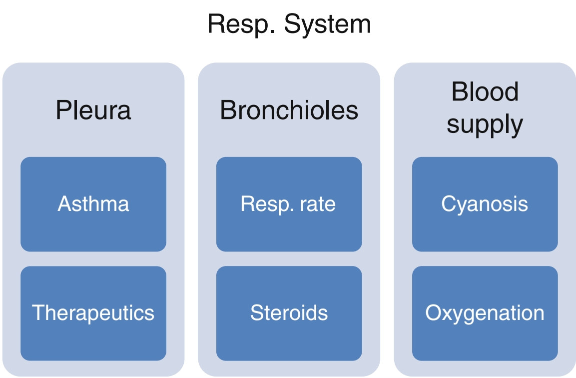
Mapping for Respiratory System

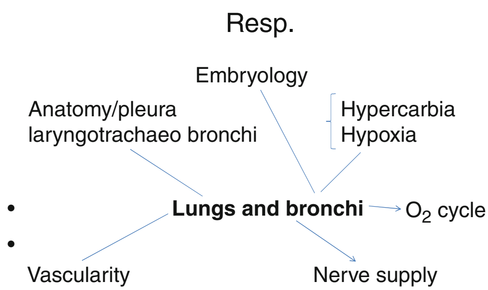


Resp. System




Resp. System
Epidemeology
Normal structure and function
Pathophysiology
Pharmacology
Public health and economics

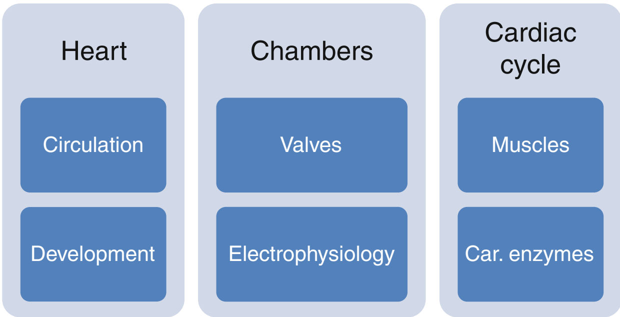

Resp. System
Pleura
Asthma
Therapeutics
Bronchioles
Resp. rate
Steroids
Blood supply
Cyanosis
Oxygenation


Resp.
Embryology
Anatomy/pleura
laryngotrachaeo bronchi
Hypercarbia
Hypoxia
Lungs and bronchi
O_2 cycle
Vascularity
Nerve supply

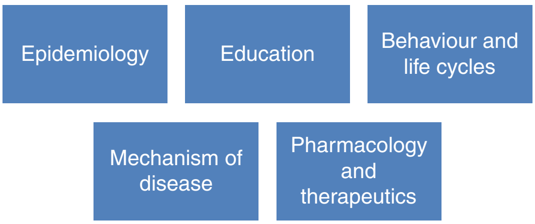
Case Based Scenarioa

- A 60 yr old man presented with fatigue, shortness of breath on exertion, light-headedness and a slow and irregular pulse for last few months.
- He is a non-smoker and physically quite fit. He denies any chest pain (angina).
- His mother had similar symptoms and was fitted with a pacemaker.

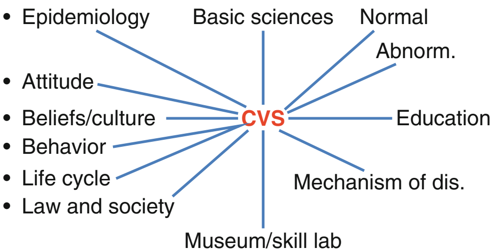
CVS



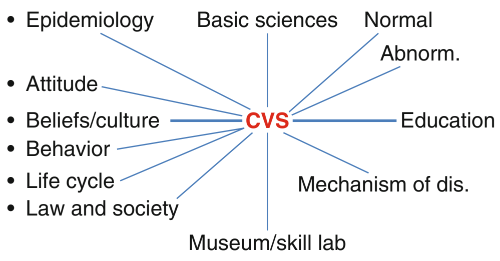
CVS

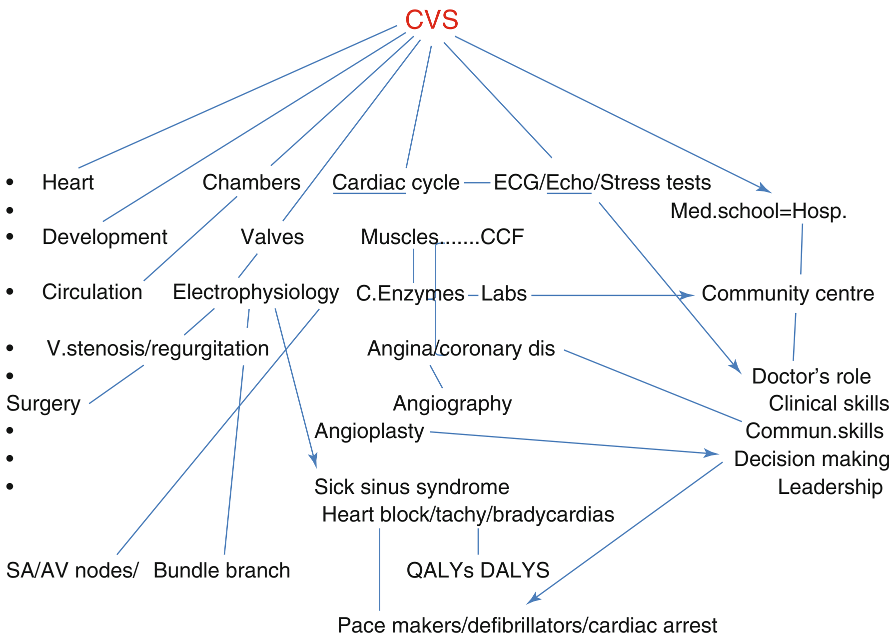


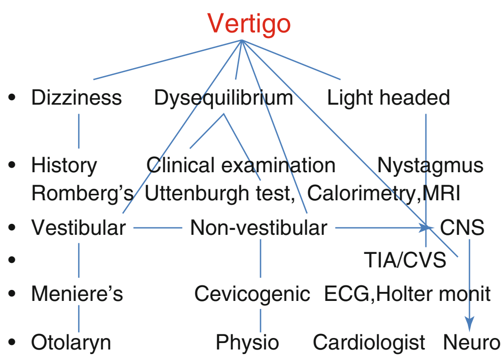
Mapping



Mapping


Epidemiology
Basic sciences
Normal
Abnorm.
Attitude
Beliefs/culture
CVS
Education
Behavior
Life cycle
Law and society
Mechanism of dis.
Museum/skill lab


CVS
Heart
Chambers
Cardiac cycle
ECG/Echo/Stress tests
Med.school=Hosp.
Development
Valves
Muscles.......CCF
Circulation
Electrophysiology
C.Enzymes
Labs
Community centre
V.stenosis/regurgitation
Angina/coronary dis
Doctor's role
Surgery
Angiography
Clinical skills
Angioplasty
Commun.skills
Decision making
Sick sinus syndrome
Leadership
Heart block/tachy/bradycardias
SA/AV nodes/
Bundle branch
QALYs DALYS
Pace makers/defibrillators/cardiac arrest


Vertigo
Dizziness
Dysequilibrium
Light headed
History
Clinical examination
Nystagmus
Romberg's
Uttenburgh test,
Calorimetry,MRI
Vestibular
Non-vestibular
CNS
TIA/CVS
Meniere's
Cevicogenic
ECG,Holter monit
Otolaryn
Physio
Cardiologist
Neuro

Here is an illustration of mapping of themes such as shock in an integrated curriculum.

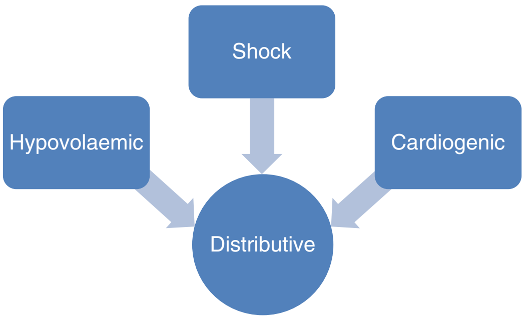
Learning resources
Scenarios
Short lecture
PBL discussion
Additional short lectures on different themes like fluid and ion pathophysiology, immunology, anaphylaxis, respiration, CVS, ECG, etc.
Skill labs for demonstration of signs of shock and management … on:
Mannequins
Simulators
Structured subjects
A&E
Trauma unit
Cardiology department
Operating room
Inpatient
Rehab services
Follow-up in outpatients
Community visits, educational workshops, etc.

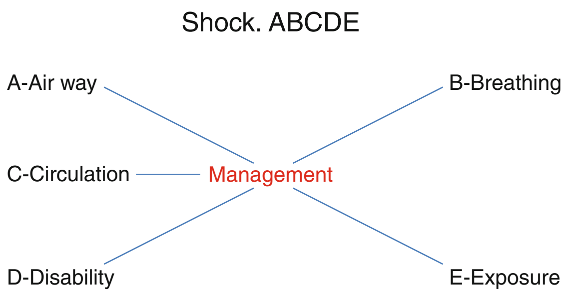
Curriculum mapping would connect all activities and keep a track of educational activities at different locations and the educational outcomes.

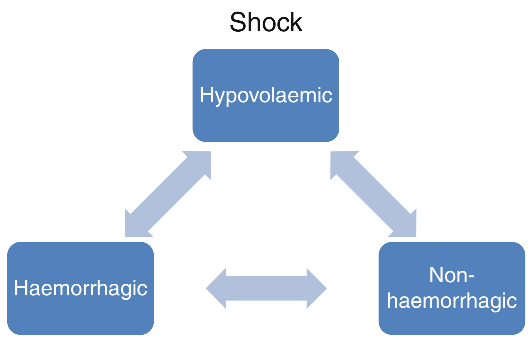
CBD: Shock as a Theme.

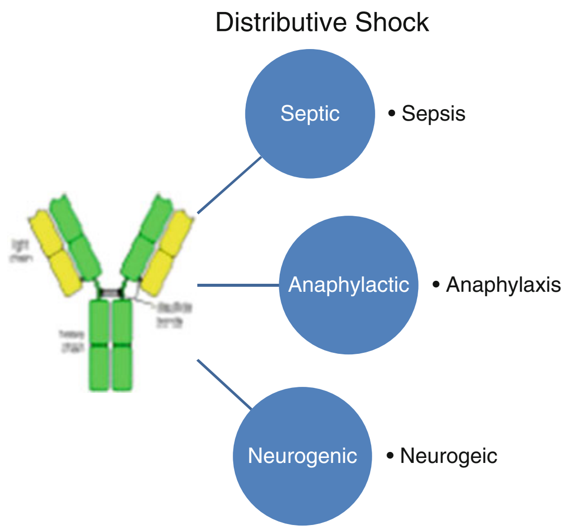
- A young man of 25 met with an RTA. He was brought to the A/E by the paramedics. He is conscious, and coherent, but has a ghastly pale look on his face. He looks anxious and perspiring. He is also in acute pain, holding his left thigh, which is stabilised by the medical team. His pulse is rapid and thready. Despite the IV fluids his BP is 90/50………

Classification of Shock




Shock. ABCDE
A-Air way
B-Breathing
C-Circulation
Management
D-Disability
E-Exposure


Shock
Hypovolaemic
Haemorrhagic
Non-haemorrhagic


Distributive Shock
Septic
• Sepsis
Anaphylactic
• Anaphylaxis
Neurogenic
• Neurogeic

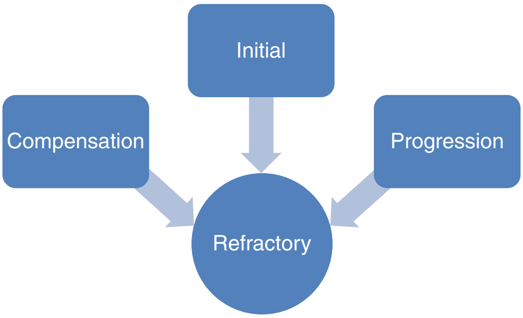
Shock\skill lab

- A-Airway
- Patient talking
- Signs of obstruction: noisy, wheezy, stridor
- Basic airway intervention> Head tilt, chin lift oral/nasal airway
- Give 15/l Ox, via mask

Shock (Look, listen, feel)

- **B-Breathing**
- **LOOK:** Pulse R, Symmetry, efforts, Spo2
- **LISTEN:** Talking in sentences, phrases, words
- Bilateral air entry, wheeze, added sounds
- **FEEL:** Trachea central, percussion, expansion
- Arterial blood gas

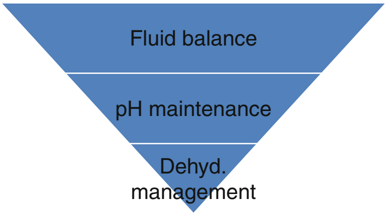
Patho-physiology of Shock



Hypovolaemic Shock

- Insufficient circulating volume
- Haemorrhagic: Internal/external
- Non-haemorrhagic
  - Dehydration
  - Excessive vomiting
  - Excessive diarrhoea
  - Excessive urine production
  - Burns

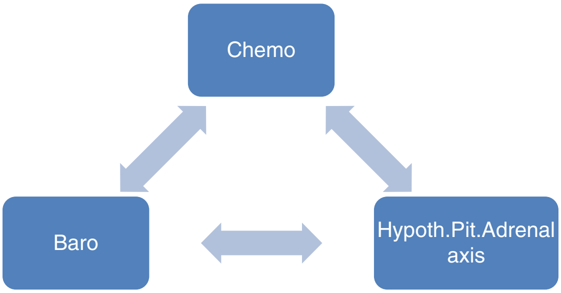
Theme: Fluids and Ions



Compensatory mechanisms

- Baroreceptors
- Peripheral vasoconstriction
- Hypothalamic-Pitutiary-Adrenal
- Starling's forces (fluid shift, interstitial – intravascular)
- Renin-angiotensin-aldosterone (vasoconstr, Na/O2 retention)

Theme: Receptors/Controls



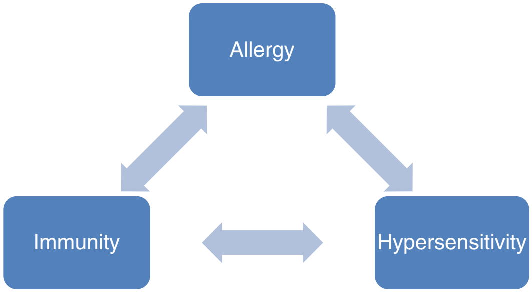
Distributive Shock

- Relative hypovolaemia due to vasodilatation caused by:
- Bacterial toxins
- Sepsis
- Allergic response. Anaphylaxis
- Interruption of sympathetic tone. Sudden spinal cord trauma

Anaphylatic Shock

- **Anaphylactic reaction**
- Type 1. Immune mediated antigen-antibody
- Cross linking IgE release, histamine, leukotrienes
- Latex gloves, colloids, antibiotics
- Anaphylactoid reaction
- No immunoglobulin cross-linkage

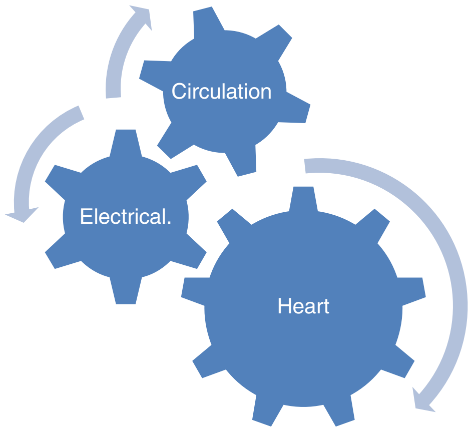
Theme: Immune system



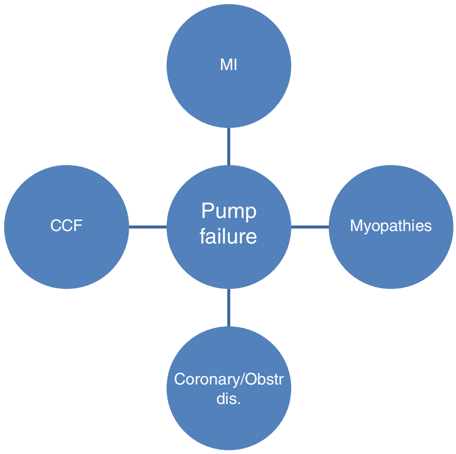
Cardiogenic shock

- Failure of heart to pump effectively
- MI
- Cardiomyopathies
- Prolonged arrhythmias
- CCF
- Chest trauma
- Obstructive
- PE
- Tamponade
- Tension pneumothorax

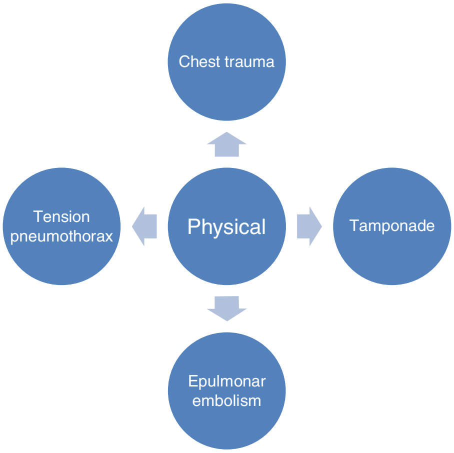
Plumbing or Power fault



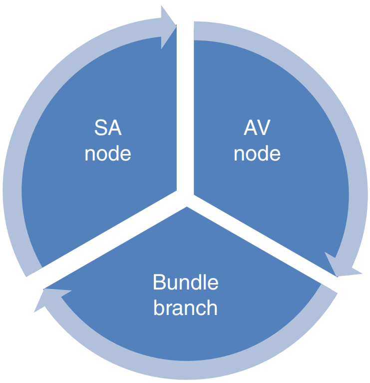
Pump failure



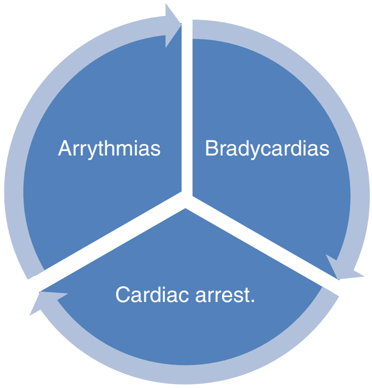
Pump failure



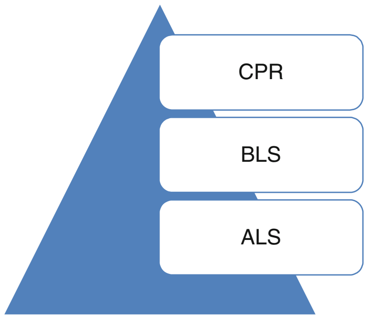
Power failure



Power failure



Theme: Arrest



Conclusion

- Curriculum mapping is the best innovation so far, in medical education.
- It should be employed in all teaching institutions.
- It is an audit of the teaching and learning activities at different levels.
- It serves all stake holders.

The above illustrations are not to describe the details of various topics mentioned here, but used as a sample only to display the learning resources and teaching strategies, etc. involved in teaching about themes such as shock or cardiac arrest in lecture halls, clinics, A/E, community, inpatient, skill laboratories, small group tutorials or a sister concern, a different hospital, etc. Mapping allows the tracking of all activities in an integrated curriculum.

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3 Teaching Techniques

Several instructional techniques are prevalent in the educational centres across the world. There is a considerable variation in these strategies, giving a vast choice to the institutions for choosing the most suitable modality, keeping their specific needs in view.

Some of the salient strategies are:

Lectures
Reading
Discussions
Problem solving exercises
Programmed learning
Learning projects
Demonstrations
Role models
Real life experiences
Audio visual aids and instructional devices
Behavioural inventions
Environmental inventions
Simulated experiences
Audio/video review of learners

3.1 Lectures

Didactic lectures are the gold standard way of imparting knowledge to pupils. Since time immemorial they have been the main means and continue to be so despite strong opposition by modern educationists in today's world. Lectures are a role model of the pedagogal way of teaching. As soon as a child begins schooling, this method comes into play. Of course, many other methods are being employed by the Montessori and other sophisticated methodologies these days, but lecturing to

S. Zaidi, M. Nasir, *Teaching and Learning Methods in Medicine*,
DOI 10.1007/978-3-319-06850-3_3

children is still in vogue. As a child grows up and joins a high school and then university, this time-tested method continues to benefit the student, literally right up to graduation and beyond. No doubt other modes of imparting education contribute, such as laboratories, museums, demonstrations and of course self study. However, lectures remain the mainstay of teaching, and are beneficial to a large mass of the student community.

Many factors influence this method of instruction. First and foremost is the choice of the topic, and that is where the syllabus has a role to play. If the subject is interesting and exciting, the lecture can be a safe and steady mode of transfer of knowledge. As discussed before, subject matter must be contemporary, precise, to the point, focused and informative. If not, the lecture can be a boring, repetitive, lengthy, overbearing, and overlong use of subject, allowing students to lose interests and become dull and disinterested. This alone kills the soul of the lecture.

Then there is the all-important subject of a lecturer. We know that gift of the gab is natural. There are people who can stretch one phrase into a saga, which may be enticing, interesting, absorbing and highly informative. Then there are others who make a simple text not just awkward to understand but extremely dull and lustreless. To be a good teacher, particularly in a medical school, it is not just vital but mandatory that the teacher must have a masterly control of his subject and deliver it skilfully, making even the dullest of subjects interesting and absorbing. Humour and medicine have close links. Some great teachers have a habit of adding a subtle word or a phrase in lighter vein in a dry subject such as anatomy, so that it becomes a focal point and stands etched out in one's memory.

Dow College had a teacher in anatomy at the medical college. He was known as Prof Waheed. All students would rush to his class as he was a great artist, drawing memorable anatomical diagrams, and always interjecting his talk with a couplet or two. For instance while describing the rotation of the embryonic heart, he added:

Rat Kay pichley pahaer kroon bars at hay dil.
Doobtay jatey hein tarey, *doobta Jata hey dil*'

It may be translated as 'during the small hours of the morning, as (a lover's) heart bleeds (in anguish) and as the stars fade way, his heart sinks into an abyss'

After all these years one can still remember the embryology of the heart through that simple couplet. It became a trigger point, a technique quite popular with modern educationists.

Boyd's book of pathology has been in syllabi for nearly a century. Its beauty lies in the simple and catchy narration of dry facts. Boyd wrote about Streptococcal throat infections, saying that' it licks the joints but bites the heart', referring to rheumatoid arthritis and mitral valve diseases.

There are some lecturers who would rely on their notes, which they would dictate verbatim, including the punctuation. One particular teacher threatened to resign his post when some naughty students deprived him of the pleasure of the inseparable companionship of his notes. He just could not move a step without them. A teacher in such a state is simply sad, to say the least. Of course, we now rely on computer generated PowerPoint, animation and what have you, but in pre-computer days the only way to teach was either through memory and recall or by referring to notes.

Lectures are economical and cost effective. One teacher can transfer ample knowledge over a period of time to a fairly large student population. That is one major reason why lecturing has been a popular mode over generations. In the comparison of cost vs benefits, no doubt lectures would beat all other modes of teaching, hands down. Some diehards may, however, disagree with the element of benefit, but no one can doubt the factor of cost. In many institutions, even today a large lecture hall can easily accommodate 80–100 students, who can all benefit from the expertise of the maestro in just a short time. In fact, many lectures by invited global celebrities may benefit several hundreds of listeners connected through a video link. Telementoring is now a routine practice and is bound to increase as the satellite services become more accessible. A teacher in Australia may be able to share his experience with a student in Barbados. How wonderful!.

Some universities in Britain are using virtual lectures for PBL (Problem-Based Learning) students, which is time saving, cost effective and quite popular with the students.

The traditional lecture involved minimal expenditure as a blackboard and a few pieces of chalk was all that was needed. When the era of slides and transparencies dawned, the task became quite expensive, as it involved photography, which was never cheap. Computers have indeed come as a blessing, as PowerPoint and other audiovisual aids are not only cheap in the long run but also the quality of the lecture presentation far exceeds all those lovely artistically, laborious lectures some of our great teachers employed. So technology has definitely revolutionised the ancient art of teaching.

The major bone of contention between the proponents and the opponents of didactic lectures is the fact that the lectures are based upon cognitive domain, i.e. memory and recall. As we know, amongst the three learning domains it is at the bottom, and therefore disapproved by all those who believe that rote memorisation does not make one a practical person, because at the end of the day, this is what we want to be, namely masters of the subject in question or, more scientifically speaking, problem solvers.

No doubt this objection is meritorious and worthy of note, The knowledge base has vastly expanded over time, and it is simply not possible for a human mind to absorb all this information, retain it, and recall it at an appropriate time. Socrates, the great master, was one who did not write nor encourage his students to make notes, as he thought the human mind had the capacity to remember all there was to remember. With great respect to the master, one might say that perhaps he was wrong, or that the knowledge base was so limited that he had good enough reason to discourage note taking. Who knows?

Computers have all but taken over that particular job, storing a huge amount of data in a tiny chip, so modern educationists have a sound argument here that the memory and recall bit may be left to the machines and the human mind be put to a better use, such as problem solving and creativity.

So, to sum it all up, one may say that the merits of a didactic lecture are manifold. It is economical, cost effective and versatile, covers a wide range of subjects, and serves a large number of students in a short time. The downside of the didactic lecture is that it is teacher-centred, pedagogal, repetitive, voluminous, perhaps boring, long and lingering, and based upon the cognitive domain of learning, thereby leaving much to be desired.

3.2 Reading

Once again, a time honoured way of imparting education and learning. Now who can forget the bedtime stories read by mothers over centuries, which have taught generation after generation many a thing in life. Before printed books were available out grannies used to narrate stories at bedtime or teatime which always carried a message. With the invention and gradual popularity of printed books, and indeed their cost effectiveness, reading has become second nature early on in life. The time-tested stories of Alice in wonderland, or Gulliver's travels, just to name a couple, are avidly read by the young , imparting virtues like goodness, courage, wisdom, and so forth.

Reading is the greatest way to obtain new knowledge, expanding the existing base and building new frameworks for future construction. It is one of the greatest pastimes for all age groups. Apart from imparting knowledge or technology, books also enable one to develop a habit of data analysis and often problem solving. Now who has not read the stories of the greatest sleuth of all times, a certain Mr Holmes, or the intriguing novels of Dame Agatha Christie. They are entertaining, inviting, imparting knowledge, encouraging the reader to think, synthesise the data, probe the dark alleys of the unknown, and, if bright enough, even solve the problem.

Textbooks have always been the main source of learning in schools and universities. Medicine is no exception. Volume after volume of text books have been written since the days when Plato documented his Apology or Aristotle his Republic. The Canon of Medicine and its like served the medieval period, and for the last couple of centuries the work – and typeface - of the printer John Baskerville of Birmingham – whose original lithograph letters are famous in the history of printing. Printed books have covered mile after mile of library shelves. The joy of reading is akin to the joy of witnessing a thing of beauty, which is a joy forever.

As the knowledge base expanded, writers struggled to contain it, sometimes failing to do so. Thus we see Sir Duke-Elder's several volumes on ophthalmology or Scot–Brown's book on otolaryngology. They all began in the form of a text book but grew into several volumes with the passage of time.

Reading is a fundamental mode of learning. It is so traditional that even today the universities have a position of Reader, reminding us of the days when a person would read a lesson to the students. In medicine, just like any other field, it is the backbone of education.

In the last few years, a new phenomenon has emerged upon global science called e-learning. With highly innovative information technology taking a strong grip on us all, the modern way of reading is through the computer. Internet is indeed the greatest gift of the scientists to mankind. It has provided us all with unparalleled source of information which no library in the world could match.

What is phenomenal is the fact that the storage of books, journals, periodicals, etc. has totally been resolved by digital technology. Large volumes of material can now be stored and accessed at all times. One does not have to have membership of a library or wait for it to open, or be limited by the number of books which can be borrowed. One has easy access to an unbelievable amount of data at all times. Now the problem is to sift through such extensive data to focus on the most relevant.

Until a few years ago, we had to write to the libraries to obtain a certain article at a cost, which could be prohibitive if a large number of references were required. Now the Cochran database and other sources are so helpful, so economical, and so easily accessible that one is inundated with knowledge.

Textbooks often become outdated by the time they reach the bookshelves in a book store or a library. Therefore one must complement them with the latest periodicals and journals. Only in the last couple of years, many hospital libraries in the UK and elsewhere have stopped displaying journal on their shelves as most are available on line.

So reading habits are changing. Instead of a printed book or a journal, one reads them online. What is even more exciting, mobile IT has made everything so accessible that one does not have to sit at a computer, simply download a book and read it. One may be travelling on a train, sitting at the airport, or simply relaxing on a beach, and may read a book, a novel, or a textbook on an iPad, Kindle, tablet or smartphone. How exciting is that! For ages we went to libraries – now the books come to us in our homes.

Reading has become even easier and continues to remain the cornerstone of education. E-reading is catching up fast, and most new books are available as e-books. Two of Zaidi's recent books have been published by Springer as standard prints as well as e-books, which are more affordable and available on demand.

3.3 Problem-Based Learning

Since its introduction at McMaster in 1969, PBL has moved forward in leaps and bounds. It is such an important subject that a full chapter has been allotted to it. Despite its great popularity, it is not universally accepted as the norm. Many controversies and questions still surround PBL.

It certainly has many advantages and a few disadvantages.

It is an andragogal way of imparting education; it is student-centred, involves small groups, and promotes active learning and critical thinking as well as decision making. It is interactive, facilitates higher cognitive domains, inculcates humanism, ethics and, most salient of all, the principle of life-long learning.

PBL also has certain salient disadvantages. For instance, this methodology is quite expensive to adopt, apply and maintain. It requires a large faculty of facilitators and instructors who must go through regular faculty training. Access is restricted to a limited number of students, raising many logistics issues. Above all, it is blamed for providing insufficient, shallow and sketchy knowledge. PBL does not suit everyone as it may not be good enough for some students; mature students seem to like it better.

The principles of problem-based learning are ancient, albeit organised and structured only in the latter half of the last century. After all, Socrates is known to have posed problems or dilemmas, never volunteering an answer. When asked by a frustrated student, he is said to have replied that he did not want to insult the minds of his pupils, who were capable problem solvers.

In the noble Quran, there is the famous story of Moses (Al Kahaf.18:65–82) where he requested Lord God to let him seek knowledge. Moses was accordingly advised to follow a certain wise man. This gentleman, known as Khizr, warned Moses not to ask any question nor expect him to explain his actions, which were flabbergasting to say the least. The story goes on to tell that first the wise man pierced a hole in the boat of a young man, his only source of livelihood, then he killed a man, then he repaired a falling wall without remuneration. Moses could not witness the acts without raising his voice, but the wise man kept admonishing him, expecting Moses to solve the riddle himself. Exasperated Moses, having failed to do so, and desperate to know the reasons for such strange acts, was then given the explanations by the wise man. The story is amazingly instructional in the art of problem solving.

Modern educationists employ PBL through a series of steps, where a small group of students, usually not more than ten, are given a virtual clinical scenario. The group then chooses a reader or chair, and a scribe. The reader reads the problem to the scribe, who writes it down on the blackboard.

The next step is that of brainstorming. The group identifies the learning issues in the problem, which are noted down by the scribe. The group also identifies the learning resources, where the facilitator, not necessarily a subject specialist, may also help.

The next step is for the students to generate a hypothesis, which requires debate and group discussion.

The group then breaks up to do self study over a specified period of time and then gather again to look at the current situation. Sometimes fresh learning objectives may crop up which need further self study and research. Eventually the group meets for the final step and arrives at a decision by solving the problem.

The whole process may take a couple of weeks or more, but the exercise does not go unrewarded, as the students really grasp the subject without rote memorising, and never forget it.

Since PBL is employed in an integrated curriculum, the basic subjects are embedded into the clinical subjects through a series of scenarios. The faculty plays a major role in developing the data bank. Since the scenarios have are used in large numbers, a continuous supply of problems is required. The academic centres would normally hold them and their keys under lock and key. The faculty is often invited to replenish the stock in bulk, but ideally they should continue to write the problems and their keys on a regular basis.

The whole philosophy of PBL revolves around the early introduction of young medics to life-like problems. Although in the initial couple of years they do not deal with the clinical work per se, concentrating only on the normal and abnormal organ functions, but right from day one they are encouraged to think critically and to build on previous knowledge each passing day.

The aim of the small group discussions is to find out what the students need to know rather than what they already know. They build the story based upon previous knowledge and learn each day, thus reaching a final point in couple of weeks when they should have attained sufficient knowledge and achieved the learning objectives.

PBL has certain well-defined goals as discussed below.

Problem-based learning inculcates the habit of learning through interactive discussion and debate, and produces active learners who are self-motivated and self-directed. They are also encouraged to be flexible in terms of knowledge base, acquiring the relevant knowledge in sufficient depth to be able to solve the problem. In other words, they are not geared to learn each and every statement about a certain condition, as was the method in the traditional curriculum. So in PBL, a student picks and chooses only the required amount or volume of knowledge, focusing on the purpose of reaching a stage to solve the problem. Huge volumes of anatomy, physiology, pathology, etc. are not really required for every undergraduate to master. There is so much knowledge these days that a human mind simply cannot cope with it. Besides, with the availability of computers and databases, all that knowledge can be accessed on demand.

Another salient aim of PBL is to enable students to develop the art of critical evaluation of knowledge, analyse it, add to it, and continue to learn throughout their lives. In fact, the modern concept of medical education is that a student may acquire *core* knowledge at medical school and *more* knowledge throughout his active life. Commitment to lifetime learning is a habit that PBL inculcates. However, some might argue that reading and lifelong learning is a habit which is personal and is duly possessed by many who may not have gone through the PBL exercise!

Medical educationists also aim at inculcating the attribute of proficiency at clinical reasoning through the process of PBL. One of the fundamental roles of a physician is to develop and hone the art of clinical reasoning through logic based upon knowledge aided by technology. It is this attribute that makes a physician a good clinician, able to sift through volumes of information, to arrive at a decision based upon clinical judgment involving reasoning and rationality. In an old fashioned way, this attribute is sometimes referred to as clinical acumen. A physician with clinical acumen is generally given due recognition by his peers, and patients alike.

PBL is also intended to develop in its students an attribute called interpersonal skills. It is an absolutely vital component of a physician's life. To be able to communicate effectively, accept worthwhile advice, constructive criticism, and mutual respect through understanding and fair play are absolutely the most profitable qualifications for a physician to possess. PBL aims at developing these through small groups, intimate discussions, listening to others rather than conducting a monologue and, above all, inculcating team spirit. In the process, one also develops the leadership qualities essential for a physician to succeed.

PBL also aims at developing reading habits, encouraging research and exploration and identifying learning issues and the approach to resources and similar qualities which would enable the student to prepare for a long and successful professional career.

The role of facilitators in PBL is very interesting. They need not be a subject specialist. In fact, some diehard PBL activists prefer to use ‘alien’ facilitators. The job of a facilitator is to split the students into groups of eight to ten students, and establish a protocol for PBL working, at the first encounter. Furthermore, he should fill in the forms and do the necessary paperwork, such as attendance sheets, procurement of stationary, flip charts, writing material, etc. His other job is to organise the timely distribution of information material, write ups, problem-related data and results of investigations, and play the part of an official time-keeper to ensure the smooth progress of each session. Unless specific time allocation is made, students may find it hard to accomplish a certain task in a given period of time, thereby spilling over into another session, and so on. It is akin to an old fashioned school exam, where the facilitator or supervisor would duly inform the examinees of the time left to finish off.

One of the essential tasks assigned to a facilitator is to control the discussion, as it might otherwise drift into areas not required to accomplish the given learning objectives. Once in a while the facilitator may have to plant a question or trigger a discussion to bring them back to the desired objective. It is akin to a shepherd gathering the flock and guiding it to the right place if they tend to drift away into the vales and dales rather than remain on the green pastures. The facilitator is also required to stimulate a thought-provoking process by asking random open ended questions, directed at the group rather than at a specific student, basically to keep them on the right path. In the process of facilitation, a facilitator is expected to judge and evaluate the performance of the group in general, but also as individuals. Some students in the group may be dominant and overactive, others lazy, submissive and reclusive. Neither the former nor the latter is good. Each student in the group must have equal and regular input, otherwise the fundamental plan of group activity and development of interpersonal communication and skills will be jeopardised.

A good facilitator can be extremely helpful to a program, as his observation, analysis and efforts at keeping the students monitored can be productive in further improving the program. The facilitator is expected to provide feedback to the head of the program in a report outlining the good and bad points of the session or sessions. As we know, it is usually the adverse reports which are more useful rather than a report which is much too mundane and totally colourless. A keen eye can observe, record and report to the program director many points which can only help the students in the long run. A good facilitator may not just point out shortcomings but may recommend corrective measures for the program and, indeed, for the individual students.

A competent facilitator can be of immense value in ensuring the given task is duly and timely finished, done and dusted, as well as evaluated by the group from the point of view of identifying the faults to improve as the activity goes along.

A cardinal principle of PBL is the identification and establishment of the learning issues in a given session.

These issues should be carefully chosen, based upon the body of knowledge to be learned in a given module. The intention should be to identify the topics the group wants to learn in the following session. The issues should be relevant, inviting, directed towards the subject and basically picked up to fill the existing vacuums in the knowledge base. Each time a session is held, fresh learning issues may be identified, which will be answers by the group through further reading and research. This exercise is repetitive, but highly rewarding, as more and more knowledge is gathered and the learning process thus becomes fulfilling and satisfying.

Of course, the knowledge is fathomless, and as philosopher saint Ali Ibne Talib said ‘ all pitchers fill up as they are filled, except the pitcher of knowledge, which continues to expand when filled’. Therefore, to gather all the knowledge in the world on a particular topic or a system is simply impossible. One must remain within the confines of learning discipline and etiquette. Learning issues may never end, but once a certain objective is achieved, the facilitator may ask the group to move on. Knowledge thus gathered in a particular exercise will always remain intact and the students can augment, replenish or refresh it throughout their lives.

And that is the most salient objective of the PBL; namely the habit of lifelong learning.

Many students at Birmingham University considered that PBL was good for those who had joined the program after graduating, even masters in other subjects. The author (SZ) had one student who had acquired a doctorate in neurophysiology join medicine, and one who had earned a master’s in pharmacology. They simply loved PBL, as they had sufficient background knowledge to build the structure of future learning through PBL. Many others who join medicine agree that when doing their high schools, i.e. A levels or their equivalent, they found it rather hard and preferred the traditional method of teaching. It is neither a scientific survey nor indeed an opinion poll, simply an observation.

In Liverpool there were also some postgraduates who came from a PBL background and were good critical thinkers and problem solvers, but they displayed large gaps in their knowledge base.

After 2 weeks of PBL for a module on an important system like the hepatobiliary system or the CVS, some students actually felt that they were lacking in knowledge due to shortage of time. Besides, the whole exercise involves considerable personal commitment, dedication, determination and real hard work to achieve the desired goal.

In the pedagogal method the responsibility usually rests with the teacher, as he determines all the parameters of learning. In the andragogal ways, of which PBL is a fine example, the onus is upon the student himself and this is sometimes the reason why the younger students find it hard to adapt.

No doubt, in terms of clinical orientation and skills to diagnose a patient's problem and solve it, the author (SZ) noted a marked difference in the capabilities of the traditional as compared with the PBL group. The latter were significantly better, but when asked about, say, the Little's area, a common on site of nose bleed, they failed to answer questions on basic anatomy. For an old fashioned teacher it may sometimes be less than appealing, but so long as the problem can be solved, most contemporary teachers will be satisfied.

There is a case in point here. If one does not from where the problem could be originating, it may be awkward and challenging to pinpoint it, let alone solve it. For instance, a traditional course will emphasise the salient sources of epistaxis, mentioning Little's area and the sphenopalatine artery, which may have to be ligated in severe cases of nasal haemorrhage. A PBL student may not know the origin and pathway of the artery, but a traditional curriculum student would.

So, while PBL is an excellent way of imparting education for higher skills, the knowledge base may remain rather deficient.

PBL is gaining popularity by the day. Major universities like Harvard and Stanford have also adopted this mode of medical education in the last few years. In the UK, cities such as Dundee, Leicester, Manchester, Leeds, Newcastle, Liverpool, and Birmingham as well as some medical schools in London and the Home Counties, as well as down south in Plymouth, are employing it in their medical schools. However, not every medical school in the US, and UK, as well as in other parts of the world, have converted to it. So one may surmise that PBL is not quite universally accepted!.

Many fine universities throughout the world are developing their own programs to inculcate the finest teaching modalities for their students. One such example is the Universiti Sains, Kelanton, Kotabahru, Malaysia, where the senior author worked as visiting professor many years ago. One of his students has gone on to a master's in medical education. Shahid believes that the clinical skills program as a laboratory method is a valuable adjunct to other forms of undergraduate medical training. He describes the process of developing a core curriculum in clinical skills based on the Dundee model for a clinical skills centre.

The School of Medical Sciences in Universiti Sains Malaysia (USM) had a well equipped skills centre. However, the PBL curriculum in the undergraduate medical program in the school needed to be integrated with a clinical skills laboratory program. In Shahid's view it was necessary to counter the perception that the contribution of PBL is insignificant in terms of building clinical competence in an integrated system at USM, compared with the traditional curricula of other medical teaching institutions in Malaysia. Shahid was working hard towards integrating clinical skills laboratory experience with the PBL curriculum (Hassan 2007)

He believed that such an exercise would support the evidence that PBL was an effective and innovative method for teaching and learning in medical schools.

Shahid Hasan is not the only educationist facing the challenge of proving the usefulness of PBL as a fine instructional strategy in medical schools. Malaysia has some of the best universities and some of the finest students as well as the faculty. For many long years Dr Mahatir Mohammad the revolutionary former Prime minister of Malaysia sent his best students to top class British and many Ivy League universities for training and higher education. When they returned home, they radically changed the level of education, bringing it up to par with any Western top class University. The process continues, and Malaysia has now grown into a giant in education, besides other fields such as industrial manufacturing and global trading. No doubt one visionary can transform a nation.

Here is another illustration of a developing country showing concerns about the status of medical education, and a desire to change. According to Saleh and colleagues (2012), medical education in Iraq is poorly assessed and there is a general lack of documented knowledge about the challenges facing this field and the needs for its development. Their study aimed to assess the existing teaching methods in the Hawler College of Medicine, Iraq from the teaching staff's perspectives to assess the knowledge of the teaching staff about student-centred learning.

A study was based upon a qualitative study based in turn on a self-administered questionnaire survey of a purposeful sample of 83 teaching staff in Hawler Medical University. The questionnaire addressed the participants' view on the positive aspects and problems of current teaching methods and priorities to change them. The qualitative data analysis was a thematic analysis.

After an exhaustive study, it was revealed that significant problems faced the existing teaching methods, including having a large number of students in the lecture hall (45.0 %), focusing on teacher-centred teaching (45.0 %) and lack of infrastructures and facilities suitable for proper teaching (26.7 %). The priorities for improving the quality of teaching methods included adoption of a small group teaching strategy in all study years (34.6 %), improving the infrastructure and facilities for teaching in the college (34.6 %) and provision of continuous academic development programs for the teaching staff (24.3 %).It was therefore concluded that the existing medical education system faced significant problems and needed important and comprehensive improvements in different areas. These scientists concluded that there was a need for further research in this field to explore the identified problems in a more in-depth manner in order to understand better the problems and needs of this important area of education.

A study by Al-Faris et al. showed that there is an international move from traditional curriculum towards the learner-centred and patient-oriented curriculum. In spite of its advantages, PBL requires a larger number of teaching staff and space. This study was done to compare PBL, lectures and modified PBL methods.

Thirty-three fifth year medical students who were taking the Family Medicine rotation participated in the study at the College of Medicine, King Saud University. Three instructors participated in the teaching of three topics to three groups of students. Students acted as controls for themselves across the three instructional methods, namely lectures, PBL and modified PBL. The main outcomes for measurement were students' recall of knowledge, problem solving skills and topic comprehension.

In the initial assessment there was a significant difference in favour of PBL and the modified PBL regarding comprehension of the topic as tested by short answer questions ($p = 0.0001$) and problem solving skills as tested by the modified essay question ($p = 0.002$). Non-significant results were observed at the second stage of assessment. The modified PBL method was the preferred one for 39 % of the students, followed by PBL (36 %) and, last, lectures (25 %).

This empirical study suggests some advantages for the PBL method and modified PBL over the lecture method. The authors recommend that larger studies are needed to confirm the results of this important issue as modified PBL is an affordable option for schools that cannot meet the staff and space requirements of the PBL curriculum.

The following factors may influence PBL activity in the context of COME specifically and other modes of education, generally.

Relevant
Always choose the common, important, manageable problems, bearing a high impact factor on the patient or the community, with due consideration of economic costs and moral values.

Multifaceted
A holistic view of patient care should take precedence over other matters. Fully informed care and management policies and plans should be kept in view.

Integrated
Horizontal integration of the basic sciences with vertical integration of clinical sciences, community matters, socio-psychological, economic and legal matters must be obtained. Above all, the pivotal role of medical ethics should be retained as a common denominator right across the curriculum.

Compatibility
Conform to the student levels and needs.

Contemporary
In clinical teaching always employ the latest information on clinical matters, including the use of contemporary terminology and practices.

Motivational
The whole exercise should motivate the learner to seek more knowledge, indulge in active participation, and develop the trait of lifelong scholarship, research, excitement and a keen eye for advancement, leadership, innovation and progress.

(*Modified from the principles of PBL Flinders University of South Australia*, *School of Medicine*, *1966*). *ref. Bashir Hammad report on COME*

Many ways of designing a problem have been discussed in standard books.

For the initiation of a PBL activity for COME in Pakistan, it was decided that a standard modality developed by Barrows and Tamblyn and published in 1980 should be adopted.

This involved the writing of a problem based on actual patient data, anonymising the data or using a simulated scenario. The steps of PBL have been discussed elsewhere in this book. They were followed as such.

There are two formal parts of a problem:

1. The student's copy
2. The tutor's guide book

1. The Student's Copy
   A scenario described in the form of a clinical problem solving exercise can be borrowed from a physician's diary or simply a mental exercise. It should be relevant to the community in which the educational exercise is being carried out. It should also be simple, practical and above all a common day to day affair. It must avoid conundrums, mind blowing dilemmas or syndromes that one may have never heard of or will possibly never encounter in practical life.

   Objectives/Tasks

   The whole objective of giving a scenario is to present a task. The formats of dealing with a given scenario are manifold:

   1. Directive. The tasks are more definite and quite explicit.
   2. Less directive. The question could be based upon aetiology, pathology and management (only in the clinical years), or simply epidemiology, anatomy, physiological basis of the problem, explanation of a biochemical process involved or pathophysiology, etc.

2. The Tutor's Guide Book
   It should contain details of the scenario, along with the necessary details about the contributory factors, possible investigations, further interventions and management. Basically, it is a guide to the problem, albeit kept for the tutor's benefit only.

3.4 Special Study Modules. SSM/Electives

Many scholarly educationists believe that, during medical school tenure, students should be allowed to select a speciality of their interest as a special study module. It helps in future planning, as a student may get to know a particular speciality or a subject that could be his future career. Some students prefer to do a BSc in their early years so that, if they like, they can go on to do a masters or a doctorate in later years. Some extremely bright students may wait to do a clinical degree or diploma with a doctorate, thus combining basic research and applied sciences; an excellent, but demanding profession indeed!

Electives are a common way of bridging the gap, and students can certainly benefit with this short time exposure to health issues in different countries – as indeed they can through the special modules. Thus many students can get to know the health problems and their management in other parts of the world. Some may eventually join global health planning and caring agencies like the WHO.

The following study duly highlights the role of gaining experience of global health issues early on in the educational period through electives. It is common practice in many developing countries, where the Deans cultivate and maintain a close liaison with prominent universities in the UK, US and elsewhere. Students are sent for an elective clinical rotation lasting from a few weeks to a few months. This practice gives them early exposure to international health care, and indeed enables them to cultivate contacts for entering a residency program.

Now that the wind is blowing in the reverse direction and many Western countries are facing the dilemma of global migration of victims of aggression, terrorism, and war, medical students in the UK, US and Europe need to know the disease patterns and the problems faced by those populations.

A study designed with just that purpose in mind was published by Dotchin and colleagues (2010). They agreed that medical students have an increasing desire to learn about the global context of health. Most UK medical schools do not include global health (GH) in their core curriculum, but do allow an elective period overseas.

Some UK medical schools offer an optional attachment in GH or, in some cases, an intercalated degree. All students at Newcastle University complete three student-selected components (SSCs), each lasting 6 weeks, in their fourth year.

This study was carried out in 2006, after a student showed special interest in learning more about global health issues. The education authorities introduced an innovative method of imparting knowledge about those issues which many students in the UK will have to face in practical life.

They devised a timetable which included lectures from clinicians, nurses and other professionals with experience of developing countries. Weekly topics covered major themes of global health issues, such as war, conflict and water supply. Students picked a project to present to their peers at the end of each week. A debate was held on two major current issues in the context of global health care, which was supported by the experience of other students who had previously chosen a special module for practical experience. It was called the Student Selected Component or SSC.

These discussions were focused on clinical components such as infectious diseases clinics, a general practice surgery with a large number of asylum seekers and refugees, and obstetrics and gynaecology clinics with doctors who have practised abroad.

The authors believe that this learning exercise in GH teaching prior to going on electives was invaluable, to set the scene for students who will never have worked in such settings before. No doubt, with global challenges becoming really universal, many countries in the West have to meet these challenges.

It is a wonderful study which gives all the more reasons for education and health planners to carry out further similarly studies in other fields, so that the modern student who practices in a global village has some experience of things to come rather than remaining isolated and oblivious.

Audit of an activity is the norm in the UK. Audit is not research. It is a method of checking out that what was evident after research is duly applied in practice. These are days of EBM (Evidence-Based Medicine). The historical habit of relying upon books, lessons taught by teachers, hearsay, etc. are gone. There must be 'Evidence' to support or reject a therapy, a diagnostic method, or to plan for the future. Feedback of an activity is one brief, instant and helpful way of checking out one's activity.

Here is a study highlighting the role of feedback for PBL strategy conducted by van Wyk and McLean (2007). The authors compliment our statement in this book that recruiting and retaining facilitators in PBL requires considerable staff development. No doubt providing meaningful feedback to individual facilitators should contribute to improved management of the tutorial group.

The study aimed at ascertaining the value ascribed by facilitators to feedback they received (based on student input) regarding their performance in the small group tutorial in a PBL curriculum. It involved a total of 37 facilitators from a representative sample, selected for their facilitation experience during the 2001–2003 period, and completed a comprehensive survey regarding their experiences.

At the end of a comprehensive study it was found that both clinical (50 %) but more notably non-clinical (70 %) facilitators found the feedback (individual facilitator and general report) useful. It was further noted that the facilitators generally preferred the qualitative comments provided by students in the open-ended section of the evaluation to the Likert scale items. Student comments were valued for the specific direction they offered facilitators to reflect and improve on their management of the small group.

For this feedback to be more useful, however, facilitators believed that it needed to be completed by more students who took time to engage critically with the criteria and reflect more honestly on their experiences. In addition, facilitators asked for feedback reports to be made available sooner so that they could improve their facilitation skills for the next group of students.

It was a helpful study, demonstrating that both qualitative and quantitative feedback is important for facilitator development and training. While quantitative feedback is important for summative purposes (e.g. quality assurance and promotion), individual student comments provide more formative feedback, allowing facilitators to reflect on and improve their management of small groups. In order for the feedback to be valid, the majority of students had to participate. Facilitators should receive feedback in time to allow them to modify their activities for the new group.

We think this is a highly repeatable practice for improving and sustaining a good quality service of providing an exemplary PBL curriculum in any institution.

PBL is gaining grounds in nearly every field of medical education. It continues, however, to be monitored by educationists in many ways. Perhaps it is because it is such an innovative way of imparting knowledge and skills that the educationists are so excited about it, or perhaps it is its unlimited capabilities that have led many to explore new avenues for its application. Either way, every contemporary university is diving in to find fresh opportunities for the application of PBL. Here is an example of its application in skill laboratories, including its effectiveness in some but not all aspects.

Zeng et al. (2011) investigated the short- and long-term effectiveness of PBL in clinical skills training. They divided 162 undergraduates into the PBL group ($n=75$) and the control group with traditional training ($n=87$) for having their clinical skills training. The t test was applied to compare the two groups regarding the scores of intern rotation examination and the OSCE as a Summative exam.

The results were quite interesting. They were as follows: on the baseline; the students in both groups got similar scores in their exams in internal medicine, before clinical intern rotation (84.04 ± 7.40 vs 82.63 ± 8.77, $p=0.287$). Regarding short-term effectiveness: compared to the control group, the students in the PBL group got higher subjective evaluation from their supervised clinicians ($p = 0.006$).

In written examination, the students of both groups got similar scores in the knowledge part (54.17 ± 9.26 vs 51.67 ± 9.56, $p = 0.92$), while the PBL group won in case reasoning questions (20.39 ± 5.27 vs 16.51 ± 4.90, $p < 0.001$). Regarding long-term effectiveness: in the graduate OSCE, the two groups got similar scores in skills operation such as venepuncture and laboratory results analyses ($p = 0.567$ and $p = 0.741$), while the students in the PBL group had better performances at case reasoning and standard patient treatment (75.59 ± 9.85 vs 71.11 ± 12.01, $p = 0.027$).

This comprehensive study resulted in the authors concluding that in the element of great short-term and long-term effectiveness, the PBL applied in the clinical skill training improves the students' ability of synthesising as well as analysing the problems with affirmative response in terms of improvement in the integrated clinical skills such as clinical thinking and interpersonal communication. The only negative observation was that PBL did not aim at basic knowledge and operation skills.

Debate on the pros and cons of traditional and PBL systems of educational strategies goes on unabated. There are strong views from both parties and relatively few comparative studies to prove the point of favouring one over the other. This study was conducted to compare lecture-based learning with problem-based learning (PBL) and to identify the deficiencies in both teaching methodologies (Sultana et al. 2010a, b).

It was a cross sectional comparative study covering 198 students studying in the 2nd and 3rd years of MBBS in Rawalpindi Medical College as the students of these two classes had been taught both by lectures and PBL sessions. They were enrolled by convenience sampling. The study was performed for a period of 2 months from January 2010 to February 2010. A structured questionnaire was used for gathering the data

It was noted that 40.92 % liked PBL alone.

It was found that 36.4% liked the combination of traditional and PBL strategy.

It was also noted that 41.91 % claimed that PBL led to a better understanding of subject while 35.34 % of respondents favoured both traditional and PBL.

Another interesting observation made was that 93 % of respondents admitted that PBL led to better clarity of their concepts while 32.82 % of students appreciated the combined strategy. Coverage of sufficient syllabus through PBL and both (LBL and PBL) was claimed by 52.54 and 65.67 % of students, respectively.

The problem of adequately trained facilitators for PBL was duly highlighted by the fact that 52.02 % were satisfied with the training of the lecturers for traditional teaching and slightly less, i.e. 52.52 %, were dissatisfied with the training of the facilitators for PBL.

Resources for PBL are another issue. This could be a potent factor in the success or failure of the program. These workers also looked at this variable. They discovered that only 44.95 % of the student population was satisfied with the resources for PBL. The most important finding from our point of view was that 55.58 % of the respondents preferred a hybridised model combining lectures with PBL.

The authors concluded, and in our view rightly so, that short introductory lectures should be combined with PBL to archive optimum results in better understanding, comprehension and conceptual clarity. Once the resources, logistics and other factors for a total PBL strategy are available, a switch over may be possible. The authors considered that further improvement of PBL services was required.

The same authors conducted another useful study in 2010, on two matching cohorts of students in their medical college to assess the efficacy of system-based and problem-based learning (PBL). Their summative results included distinctions compared with cohorts using the traditional strategy. Results showed that the failure rate in lecture-based subjects was found to be higher (54.3 %) than for those who attended a combined strategy of lectures and PBL (45.7 %).

They also looked at the rate of higher distinction obtained by the matching cohorts. The percentage of distinctions was higher (52.4 %) in the hybridised group compared to those obtained via traditional lectures (47.6 %). Furthermore a matching proportion of students from both categories got grade A. Interestingly enough, grade C was obtained by only three students who were taught by both PBL and lectures as compared to five students who only attended lectures. It was also noted that 86 and 83 % of the students taught by the hybridised version and lectures alone, respectively, passed the examination.

The authors believe that PBL along with lectures gave overall better results with more distinctions.

The following study by Zhang et al. (2011), conducted in a totally different set-up, seems to complement the findings of Sultana and colleague's mentioned above. They explored the effects of lecture-based learning (LBL), PBL or a combination of both on cardiovascular system anatomy teaching. In this study nine classes majoring in clinical medicine of Grade 2009 were randomly divided into the LBL class, the PBL class and the PBL combined with LBL class. The examination scores and questionnaire were used to evaluate the teaching effect.

Zhang et al. (2011) found that the students of the LBL class did well in the objective questions test but badly in case analysis. In contrast, the students of the PBL class did well in case analysis but were weak in the objective questions test. However, the students of PBL combined with LBL class got good grades in both of them. Questionnaires showed that teaching through the PBL and LBL combined method improved communicative ability, learning motivation, comprehensive analysis ability, language skills and so on.

This study concluded that a combination of PBL and LBL not only enhances students' memories for anatomical facts but also helps students practice efficiently what they have learned in the analysis of clinical cases. Furthermore, the method of PBL combined with LBL improves, to a certain extent, students' comprehensive qualities.

It appears that the hybridised model of teaching through the use of introductory short lectures followed by small group PBL sessions works better in many countries, particularly in the developing nations. This may be partly because of the fact that many such institutions accept younger students in their medical programs, whereas in many Western universities the students are more mature and like PBL.

The other factor which was highlighted by Shankar (2010) needs further exploration as the cultural aspects of education is an under-investigated entity. Eastern culture is more family orientated where authority rests with the family head. Such a patriarchal or matriarchal influence becomes an integral part of child's development. Therefore, when the students join a school they take their teacher as a father figure. The habit goes on to become part of their psyche. At medical school or university these Asian boys and girls still accord the same respect and grant authority to the teachers. In fact they look to the teachers to spoon feed them. That is why the traditional system of teaching is so popular in those countries. Resistance to change to anything alien comes from the faculty as well as the student body. The concept of combining lectures with PBL and case-based scenarios could be a transitional step towards a total PBL curriculum.

The role of PBL in modern education has become established but nevertheless remains a point of debate and discussion, the main reason being its need for a trained faculty and logistics, amongst numerous other factors. However, here is an unusual study which duly identifies a hidden factor of the impact of culture on education. Shankar (2010) investigated the philosophy of PBL through this study. He revisited the convention that PBL uses patient problems as a context for students to learn problem-solving skills and acquire knowledge of basic and clinical sciences. PBL is based on the principles of adult learning, i.e. andragogy. Shankar reminded us that PBL takes place in small groups and learning depends on the effectiveness of the small group process.

He quite appropriately highlighted that there is a lack of agreement on what constitutes PBL. It is the general perception that PBL is active, adult-oriented, problem-centred, student-centred, collaborative, integrated and interdisciplinary, and that it operates in a clinical context. He agrees there are a number of advantages to be gained from PBL. However, PBL is demanding in terms of time, teaching materials and physical resources. A PBL facilitator should be comfortable with relinquishing authority and exerting indirect control.

Shankar reminds the reader of an important aspect of social anthropology, which only those who have worked in different cultures can fully appreciate. Some authors believe that Asian cultures have an authoritarian student–teacher relationship. In other words, the teacher is the boss and the student's obedience is a tradition that goes back centuries if not millennia. Shankar is right in commenting that there is a high degree of acceptance of authority and paternalism; knowledge is seen as something which is transmitted by the teacher.

Despite that factor, Shankar believes that most Asian schools and students seem to be positive about adapting to PBL; the effectiveness of PBL is being seriously studied and fresh learning approaches are also under development.

Many other social scientists believe there is a contrast between the Eastern and the Western cultures. It may reflect its impact on many things such as morality, ethics, and education, amongst other things.

Zahedi and Larejani (2009) have discussed the salient differences in a fine article. They believe that Eastern culture is family oriented, broad based and interdependent upon numerous factors, such as values, customs, traditions and clan ship.

It is thus strongly textured and reliable in difficult times. It also enjoys close family ties, sharing grief as well as pleasure. It also believes in authoritarianism, paternalism and obedience to the rightful authority.

Western culture, according to these authors, is individualistic, lonely, insecure, self centred, and selfish. It is also autonomous, encouraging erosion of authority, and a rebellious attitude.

Translated into the field of education, one can relate to Shankar's observation and endorse it.

The cultural aspect of paternalistic approach being an integral part of Asian and the Eastern psyche is further highlighted by the following study.

Dharap et al. (2008) thoroughly investigated the issue of student perception of the pre-clerkship phase with regard to their experience of the problem-based learning (PBL) curriculum, which as we know, is variable. They decided to determine the factors and perceptions of how students in the pre-clerkship phase perceived PBL and the changes in these perceptions with increasing experience in the College of Medicine and Medical Sciences, Arabian Gulf University, Bahrain.

The students were interviewed in focus groups and responses were used to develop a structured questionnaire, with 25 sets of questions on 5 components of the PBL process, which was distributed to 148 students. Response rates were 96, 76 and 46 % for years 2, 3 and 4, respectively.

The inference made from this fairly exhaustive study was that students perceived PBL as interesting and it developed self-confidence. However, there is an anthropological aspect, requiring closer attention and further research by the educationists. The workers noted that, in tutorials, most students were willing to challenge each other but not the tutor (the same phenomenon of respect and authority given to the teacher thus avoiding any challenge by posing a question). Students preferred discussions with peers to consulting seniors. As the seniority increased, the students tended to discuss more during the second tutorial and tended to ask more questions. While preparing for end-of-unit examinations, students attempted inter-problem integration less than intra-problem integration.

It was concluded that students perceived PBL as an interesting, though difficult, method of learning, which helped to develop their self-confidence but may result in gaps in their knowledge.

The authors point out that, while writing the problems, the tendency to focus on clinical aspects of a given problem at the expense of its basic science concepts should be discouraged by careful construction of the problems and tutor guides.

It was also observed that, while the students challenged their peers during discussion, all students did not prepare adequately for the second tutorial. In their view, the integrated learning could be further enhanced through focusing on the themes identified in the unit booklets and the use of integrated questions on these themes.

One major obstacle in the development of PBL and its fully-fledged implementation is the lack of a trained faculty. It is a job that the department of medical education must take on in each institution. Teacher training, through seminars and workshops, is an essential component of medical education, more so for the hitherto innovative strategy of the PBL, as was noted in the following study.

Mohammad et al. (2010) looked at the role of workshops in PBL tutor training. Regular problem-based learning (PBL) workshops are to be conducted in order to get to know the lacunae of the PBL facilitators and improve on various aspects; this was rightly pointed out in this study.. They investigated a total of 20 workshops (with duration of 2 days) which were conducted over 3 years, training 173 persons. A 15-item questionnaire was distributed which covered each of the workshop activities as well as the facilities provided during the training sessions. Satisfaction was rated as '0' to '5' where '0' was 'disastrous' and '5' was considered as 'excellent'

The study revealed that the 2-day PBL facilitator training session exposed the teachers to an innovative method of conducting student-centred small group learning. The results obtained from the study might be helpful in proper conductance of PBL at other medical institutions.

The participation of facilitators and their competence level play a huge role in the PBL programs. So Mohammad et al. (2009) looked at the role of facilitators and their skills in PBL format The new curriculum at the Universiti Kebangsaan Malaysia's medical programme uses problem-based learning (PBL) as the main teaching-learning strategy.

They embarked upon a task to evaluate the facilitators' skills in conducting PBL tutorials by evaluating questionnaires at the end of each PBL case. The information gathered from questionnaires was triangulated by structured interview with students' PBL group leaders. There were 72 facilitators involved in conducting 13 PBL sessions throughout semester 3. A total of 2,951 questionnaires were distributed to students prior to each PBL session. The response rate ranged from 78 to 97.8 % and the overall response rate was 81.5 %.

The results showed that more than 99 % of the students perceived that facilitators had good knowledge of PBL process and 97 % of students agreed and strongly agreed that the facilitators showed interest in students' learning. Regarding students' perception on facilitators giving feedback, 7.7 % of students disagreed that facilitators gave feedback to them. During the interview, students described three categories of facilitators: (1) facilitators who were actively involved in the tutorial process, probing students for breadth and depth of knowledge; (2) facilitators who were dominant and did not allow free discussion among students; and (3) facilitators who appeared passive and did not provide any guidance to students.

The authors eventually concluded that the facilitators' knowledge in the PBL process was satisfactory. However, their skill in probing students' breadth and depth of knowledge is lacking and needs to be addressed during faculty development. However, giving feedback to students was not consistent among facilitators.

3.5 Skill Laboratories/Artificial Methods

These educational tools are currently in great demand and enjoying huge popularity. Since the resurrection of medical ethics in the last couple of decades, using a patient as teaching material has become questionable Issues such as confidentiality, anonymity and personal dignity have been rightly given their due place. In the not so distant past, ward rounds were a common way of teaching in most university hospitals. Some readers may actually recall the popular movies of the Carry On series, where the renowned actor James Robertson Justice played the part of a Professor/Consultant. When he went on a teaching round, a whole brigade of staff assistants and students followed him. He would then ask one of the juniors or a student to narrate the history of the patient and then nearly all, or at least some, of them happily examined the patient on the spot. The adjacent patient, indeed the whole ward paid full attention to what was going on, waiting for their turn. Indeed, that was the customary way for a long time. However, frankly, it is quite unfair. The personal dignity of a human being is more important than the teaching of clinical skills. Many times personal dignity was indeed compromised, while a patient underwent scrutiny either in outpatient clinics or wards.

This has all changed. However, we still need to demonstrate practical skills to our students. In the olden days, most practical work in the basic sciences was carried out in dark and unventilated laboratories or dissection halls, or indeed museums. Many practicals in experimental physiology were carried out with a poor frog pitched on a slab. Cadaver dissection, no doubt, was extremely valuable, but many questions were raised as to the necessity of such an exercise, sometimes stretching over 2 years. Besides, procurement of cadavers in such large numbers was always an issue. A couple of centuries ago they used to have specialists providing freshly exhumed dead bodies to the anatomy halls. Now body snatchers and grave diggers have been assigned to the past. Some time ago it was reported in a certain part of the world, that a laboratory assistant or student allegedly caught a fatal viral infection from an obviously unprepared body, raising many more questions. Then there was always the question as to whether it was really necessary to teach such minute and precise details of anatomy to each and every student, some of whom may not even become clinicians, opting for administrative posts or consulting jobs as health planners, etc.

So, over time, cadaveric dissections became unpopular, and were partly replaced with prosected specimens, which are currently in use in some centres, although many advanced centres, particularly in the USA, have replaced them with plastinated bodies.

Plastinated bodies are expensive but absolutely state-of-the-art for educational purposes. They are neat and clean, and extremely detailed, perfect for teaching anatomy.

Many innovative technologies are hitting the market these days – a virtual human body, generated through expensive software, is available. It is called Anatomage and is already in use in some universities like the Al-Faisal in Riyadh. It is simply mind boggling and may indeed replace even plastinated bodies in due course.

The rapid advancement in technology has therefore replaced smelly dissection halls and dingy laboratories with state-of-the-art modern, sleek and exciting skill laboratories.

The skill laboratories have all but changed the teaching scenario. A huge variety of equipment is available, beginning with very basic items such as BP monitors, ECGs, etc. and going on to highly advanced manikins. Actually, some of them bleed on demand; some even moan and groan on command.

Currently, the skill laboratories are an integral part of the educational plan. In the integrated curriculum, the students can learn theoretical subjects more effectively when they also go to the skill laboratories to perform experiments, complementing the theory. Such an exercise has a lasting impression on the human mind, and is definitely the best way to impart an education.

For instance, in a module on CVS, after an introductory talk by the teacher, they go for small group discussions, where they learn about, say, the heart in health and in disease. They then go to the skill laboratory to look at the heart model, study it thoroughly, look at the normal ECG, check each other's pulse and BP, then have a simulated scenario of a patient in angina, his relevant ECG, even the picture of relevant blood studies, cardiac enzymes, etc. Likewise, they might go through a practical workshop on CPR, BLS, ALS, or, more senior students, ATLS. Such practicals are definitely more useful than just teaching theory!

The skill laboratories can be used for several purposes to impart technical skills, in many innovative ways. CME (Continued Medical Education) is a component of medical education. The clinical skill laboratories can be a wonderful and potent resource for training the faculty when real patient teaching is not possible.

A workshop for training tutors and young facilitators could be held in a clinical skill laboratory, providing required number of CME points.

The skill laboratories can be used at all levels of medical education. They can be divided into:

Preclinical skill laboratories
Clinical skill laboratories
Postgraduate training and practical application laboratories

They can be employed to train the students in the following domains:

Application of theoretical knowledge in preclinical years, e.g. checking BP, etc.
Physical and clinical examination, such as the CVS or respiratory system examination, etc.
Procedural skills and practice of various procedures such as setting up a central venous line, etc.
Various laboratory skills, e.g. drawing up a blood sample or studying the blood picture, etc. Obviously these are now performed by a central laboratory, but a student is expected to know the basics, hence requiring a good learning exercise in the skills laboratory.
Communication skills. This is a major component of a modern skill laboratory. This is such an important subject that we have discussed it separately in this book. Suffice it to say that a skill laboratory is the best place to learn the art if communication. It is more important 'how to say' than 'what to say' in modern health care.

The skill laboratories are used for progressively increasing the burden of learning through a structured teaching program. For instance, initially a didactic basis for a certain activity is explained by the facilitator, such as drawing a blood sample; then the students practice on the manikins under observation. They would then move on to more complex activities such as setting up a central venous line, inserting a nasogastric tube or incubating a patient, obviously all on manikins. A gradual increase in gaining expertise in various practices is the best way to learn for long-term use. Besides, repetition of different techniques and procedures will make the student confident enough to apply to live patients in the future.

In the next stage the students can experiment on each other to examine normal features such as a normal pulse or BP, or an ECG. Such an exercise gives them a real feel of dealing with patients in real life.

The next stage is to learn the art of record taking or breaking bad news to a simulated patient. All those who are trained to act the part of a patient are called simulated patients. However, those who acquire the expertise over a period of time to play the part mimicking a real patient as if they are real are called 'structure' patients, and those who are employed in the wards in an actual clinical setting are called 'embedded' patients. They are actors with fine skills who are prepared to portray the part as assigned. Furthermore, their faces and body parts are painted to mimic a bruise, a graze or a wound. A hot inflamed knee or ankle can be produced by using a hot water bottle before an examination. A cold limb displaying diminished vascularity can be produced by covering the limb with an ice pack prior to examination by the students.

Different kinds of models such as animals or human cadavers are often used in the skill laboratories for demonstrating, teaching and learning various surgical skills. Such specialised workshops are usually run by specialists in special centers dedicated to a particular specialty, although a medical school is still an ideal location for such activities.

Subjective symptoms like moaning and groaning can easily be added by the actors, giving a real-life picture in a simulated environment.

Assessment and evaluation is through the OSCE. This topic is discussed at length in Chap. 4 on Evaluation and Assessment in this book.

Green and colleagues (2003) carried out a study which, incorporating clinical content into medical education faculty development programs, has proposed a strategy to consolidate faculty continuing medical education time and enhancing learning. They developed a faculty development program for ambulatory internal medicine preceptors which integrated primary care genetics with ambulatory precepting. According to this study, this instructional strategy addresses both areas simultaneously and includes facilitated discussions, mini-lectures, trigger tapes and role plays.

Every study should be checked through a process of scientific evaluation. This program conducted a pre-post trial. Skills were measured by retrospective pre-post self-reported ratings and behaviour by self-reported implementation of commitment to change (CTC) statements. Participants' ($n=26$) ambulatory precepting and primary care genetics skill ratings improved after the intervention. They listed an average of 2.4 clinical teaching CTC statements and 2.0 clinical practice CTC statements. By 3 months after the workshop, preceptors, as a group, fully implemented 32

(38 %), partially implemented 35 (41 %) and failed to implement 18 (21 %) CTC statements.

The most common barrier to clinical teaching change was insufficient skills (8 of 25; 32 %) and to clinical practice change was lack of a suitable patient (15 of 25; 60 %). Integrating clinical content with clinical teaching in a faculty development workshop is feasible, can improve clinical and teaching skills and can facilitate behavioural change. And what better place to instruct clinical skills than a skills laboratory. So to use these modern tools of education, teaching and learning in the skills laboratory could be a good way forward.

Many diehards felt that clinical exposure in the eagerly years may not be conducive enough at this stage of studentship. That is old-fashioned thinking. Modern educationists strongly favour the earliest possible exposure of students to the clinical setting. Widyandana et al. (2012) believe that students may encounter difficulties when they have to apply clinical skills trained in their pre-clinical studies in clerkships. Early clinical exposure in the pre-clinical phase has been recommended to reduce these transition problems.

The aim of their study was to explore differences in students' experiences during the first clerkships between students exclusively trained in a skills laboratory and peers for whom part of their skills training was substituted by early clinical experiences (ECE). Thirty pre-clinical students trained in clinical skills exclusively in a skills laboratory; 30 peers received part of their skills training in PHC centres. Within half a year after commencing their clerkships, all 60 students shared their experiences in focus group discussions (FGDs). Verbatim transcripts of FGDs were analysed using Atlas-Ti software.

Widyandana and colleagues (2012) found that the clerkship students who had participated in ECE in PHC centres felt better prepared to perform their clinical skills during first clerkships than peers who had only practiced in a skills laboratory. ECE in PHC centres impacted positively in particular on students' confidence, clinical reasoning and interpersonal communication. It was thus concluded that, in an Indonesian setting, ECE in PHC centres reduce difficulties commonly encountered by medical students in first clerkships.

This study duly highlights the ageless problem of the basic subjects being taught in the early years. So by the time a student enters the clinical years or begins his internship, he has all but forgotten the anatomy and physiology. This is one reason why modern curricula have integrated the basic subjects with the clinical subjects throughout the graduation program. It is best to stretch the knowledge of fundamental subjects throughout the program, which may vary from 4 to 7 years to make life easy for the young graduate to recall details of anatomy, physiology, biochemistry, etc. when dealing with a patient in clinical practice.

Undoubtedly the best change affecting the curriculum, is the horizontal and vertical integration of the subjects, taught system-wise rather than organ-based, split into pre-clinical and clinical years.

This study duly highlights the problem for young graduates who may have not been through an integrated curriculum.

3.6 Transferring Skills Through Practical Demonstration

Practical demonstration of a techniques or a procedure is the best way to transfer a skill to a student. A vast majority will remember the procedure when they watch it and nearly all will remember and be able to apply it if they can practice it too. For a permanent impression on the human mind, observation, intellectual air impression, assimilation, processing and then the practical application of the procedure through demonstration, critique and feedback represent the usual sequence of events.

For transfer of skill, it is customary that a demonstrator goes through a few steps to conduct the session:

Learning objectives are defined, keeping the syllabus and the timetable in view. The session has a format which should be well defined and clarified for the benefit of all participants. Time frame, practical steps to follow, possible hazards, complications and follow up, etc. should be discussed by the facilitator as an introductory talk. In an experiment such as a practice to perform a venesection, the objectives may be defined as the reasons for doing it, its alternatives, its possible limitations, complications and difficulties in the procedure, false punctures, development of haematoma, failure to ligate and secure the vein, etc.

If the patients or structured subjects are employed for a skill demonstration, all ethical steps must be followed. The most important, of course, is the subject of informed consent. It should be both verbal and documented. The procedure should be explained to the person, including possible risks or complications.

Individual or group practice is the best way to apply technical skill in a given scenario. Ideally it should be one on one, but, because of the limited availability of models, specimens or subjects, a small a group of two or three can be employed. For instance, in a temporal bone workshop, many institutions running such skill laboratories will have an ample supply of prepared models. Each candidate can go through the steps given in an instructional sheet, while the facilitator or the master in charge could check each step as he wanders between the work stations.

For a simpler task, like a Fine Needle Aspiration (FNA) in a lump, one may use models, and students can practice on them as many times as necessary. The best way to learn is through practice. A supervised session may be followed by a series of practice sessions amongst the batch of students to get the real feel of the technique. Of course it is not the same as a procedure on a live patient, which the students can only observe in the early stages and practice once they have reached that stage of training.

Like any other educational activity, the assessment and evaluation should be immediate. Self-critique is the best way to improve, but critique by the master as well as peers is always helpful. Many skill laboratories are well supplied with performance checklists and feedback forms. They are extremely helpful in finding the deficiencies in the work, or individuals, with a view to improve and perform better each time.

Similarly the role of an instructor is doubly important to improve the functioning of a student or a batch of students. Feedback should be immediate and best discussed with the individual in private. The teacher does not and should not cause any embarrassment to a student, lest he loses his self confidence for ever. Group assessment may be given to the head of the department in written form after the session. The students should also have the right and opportunity to provide feedback about the instructor. It could be personal after the session, or through a feedback form, the sole objective being improvement of the session.

It is not easy being a teacher. One must have the necessary combination of knowledge, skills and attitude and, above all, tolerance, patience and magnanimity. Critique or criticism by a student may sometimes hurt one's feelings but a reformer has to be tolerant, understating and patient.

A teacher is a reformer, and reformers are always opposed by the reactionary forces. The burden of reforming the generations is not a light one. It is challenging, demanding and burdensome. It is also the profession of monks, priests, saints and prophets.

'Oh Lord, how heavy is thy honour to bear' said Thomas Becket in Canterbury Cathedral when he was about to be murdered by the hounds of Henry the second.

A duty bound, conscientious teacher may sometimes feel the same burden. Some are constantly involved in teaching; others combine innovation, research and use of modern technology in promoting the cause of reforming mankind through education.

This is a century of information technology. Computers, Internet, Facebook, Twitter, LinkedIn, etc. have all changed the whole concept of tracing, learning and socializing. A thousand search engines are now accessible through the net. But, as the saying goes, "what's worth doing is worth doing well". This applies more to the art of education than other things in life.

Quadri et al. (2008) investigated the role of combined clinical skills and medical informatics learning by offering a combined 'SCIL' rotation to third-year medical students and to determine its long-term impact. They set up a highly innovative combined clinical skills and medical informatics laboratory (SCIL) at their institution with international collaboration. Nine months to 1 year after formal third year SCIL rotations were conducted, a questionnaire rated on the (1–5) Likert scale was administered to the inaugural class undergoing this rotation. It was found after the survey was complete that the rotation was rated positively in terms of both acquisition of clinical skills and medical informatics skills (overall rotation rating: 3.32 ± 0.53). It paved the way for future application based upon the positive long-term impact on undergraduate medical students of combined clinical skills and medical informatics rotation.

3.7 Simulation

This innovative way of teaching clinical skills is fast becoming popular. Many forms of simulators are available. Some gadgets are expensive and require replenishments, others are relatively inexpensive. Human patient simulators can be extremely valuable in teaching clinical skills. For instance, they can be trained to portray the part of an RTA or a critically wounded patient or a patient in severe pain or acute dyspnoea requiring urgent intervention.

Task trainers may vary from a very basic ham hock employed for suturing skills to a virtual interface for teaching endoscopic surgical skills. Psychomotor skills such as catheterization or incision and drainage or performing an intubation, etc. require expensive specially designed equipment such as a rubberised pelvis or a laryngeal specimen for intubation.

There is a standard protocol observed by departments of medical education in developing and planning a simulation. Each department has its own protocol which takes into account specific measures such as learning objectives and outcomes. They also develop the material best suited to achieve a particular objective.

Standardised patients are given a case-based clinical scenario, with appropriate training to behave as expected in that particular clinical condition.

The major advantage of simulation is that a student can learn the practical skills, perform a procedure or develop the technique to overcome a clinical problem in real time. Since no live patient is involved, the element of risk is removed and the learner acquires the habit of observing the usual care customarily needed by actual patients.

Cherry and Ali (2008) mention in their study that the use of simulation-based technology in trauma education has focused on providing a safe and effective alternative to the more traditional methods used to teach technical skills and critical concepts in trauma resuscitation. Trauma team training using simulation-based technology is also being used to develop skills in leadership, team-information sharing, communication, and decision making. The integration of simulators into the medical student curriculum, residency training, and continuing medical education has been strongly recommended by the American College of Surgeons as an innovative means of enhancing patient safety, reducing medical errors, and performing a systematic evaluation of various competencies. Advanced human patient simulators are increasingly being used in trauma as an evaluation tool to assess clinical performance and to teach and reinforce essential knowledge, skills and abilities. A number of speciality simulators in trauma and critical care have also been designed to meet these educational objectives. Ongoing educational research is still needed to validate long-term retention of knowledge and skills, provide reliable methods to evaluate teaching effectiveness and performance, and to demonstrate improvement in patient safety and overall quality of care.

One cannot agree more with these workers, who have supported the use of skill laboratories through this useful study.

Virtuality is becoming more of a reality in many fields of life, including medical education. Lehman et al. (2013) studied the role of virtual patients for medical teaching. They remind us that only a few reports exist on how to prepare medical students for skills laboratory training. So they investigated how students and tutors perceive a blended learning approach using virtual patients (VPs) as preparation for skills training.

In this study they invited fifth-year medical students ($n = 617$) to participate voluntarily in a paediatric skills laboratory with four specially designed virtual patients.

The cases focused on procedures in the laboratory using interactive questions, static and interactive images, and video clips. All students were asked to assess the virtual patient design. After participating in the skills laboratory, 310 of the 617 students were additionally asked to assess the blended learning approach through established questionnaires. Tutors' perceptions ($n=9$) were assessed by semi-structured interviews.

In this study, from the 617 students 1,459 VP design questionnaires were returned (59.1 %). Of the 310 students, 213 chose to participate in the skills laboratory; 179 blended learning questionnaires were returned (84.0 %). Students provided high overall acceptance ratings of the VP design and blended learning approach. By using virtual patients, the preparation and the skills laboratory time was felt to be used more effectively. Tutors perceived students as being well prepared for the skills laboratory with efficient uses of time. They discovered that overall acceptance of the blended learning approach was high among students and tutors, claiming that virtual patients proved to be a convenient cognitive preparation tool for skills training. This study certainly provides food for thought and another useful tool for the skill laboratories to provide efficient clinical training.

Merits of the artificial methods and skill labs are manifold. The salient features are as follows:

1. Effective in imparting education at higher domains of learning
2. Efficient and highly interactive
3. Learners learn at their own pace, which is much appreciated by most students
4. Learning is under the tutelage of supervisors/facilitators

Just like any other activity, they have a few demerits too. They are expensive to procure and maintain, often requiring replenishment and supplies. The gadgets are delicate at times, needing care, which may sometimes be lacking. The skill laboratories require controlled environments with adequate space, lights and sound control, but, above all, trained faculty, instructors, and laboratory staff, often needing regular courses and workshops to keep up to date.

Standardised patients require highly trained actors who are expensive and often difficult to come by. However, those who are fully trained can in fact mimic the real patient so closely that one is bound to applaud them. They can give a precise history, allow a physical examination, show appropriate facial expressions, moan, grunt or groan at an appropriate time, even grimace and show displeasure if poked at an allegedly tender right lower abdomen, mimicking, a tender spot at McBurney's point, so pathognomonic of an acute appendicitis.

In a workshop on roadside management of trauma patients, one of the authors was duly impressed with the way an actor was given suitable makeup, with bruises here and there, and his facial expressions, shortness of breath, and bleeding wound in his forehead, mimicking early signs of concussion, approaching unconsciousness, retching and feeling sick. It was very impressive. Once the workshop was over, SZ went to see him, and he turned out to be a part-time actor in Shakespeare's town, Stratford-upon-Avon, not far from Birmingham where the workshop was held.

The use of standardised patients is on the rise, as more and more difficulties are encountered by teachers in involving actual patients. Although expensive and difficult to procure, the use of standardised patients has no limitations in terms of curricula. They can be employed in both traditional and integrated PBL-based courses.

An innovative use of standardised subjects was carried out by Gellua and Yudkowski (2003), when they used the standardised students for faculty training. The main purpose of this study was to improve teaching skills.

The faculty development programs described focused on the skills of providing feedback and brief clinical teaching. At the beginning of each session, each participant was videotaped in encounters with two different SSs. Using microteaching (an instructional method in which learners view short segments of their own videotaped performance and discuss the tapes with a facilitator, consultant or other workshop participants), each group of participants and instructors reviewed the tapes and reflected on the encounters, providing immediate feedback to participants and modelling different approaches to the same teaching problem. The same process was repeated with more complicated scenarios after 2 weeks and again after 6 months, offering reinforcement, further practice and more sophisticated development of the strategies learned. Participants completed post-session evaluations and a follow-up telephone survey.

This study involved 36 faculty members from the colleges of medicine, dentistry, pharmacy and nursing in workshops in 2000–2001. The workshops were rated as highly relevant to participants' teaching, and most participants reported that they had learned a great deal. Participants most appreciated reviewing the videotaped interactions, the feedback they received, the interactions with their colleagues, the interdisciplinary nature of the groups and the practical focus of the workshops.

The study proved that the standardised students provided a high fidelity, low risk, simulated environment in which faculty could reflect on and experiment with new teaching behaviours. They believe that such encounters can enhance the effectiveness and impact of faculty development programs to improve clinical teaching skills.

Tran et al. (2012) have touched the most sensitive nerve in the following study. The advantages of using simulators in skills training are generally recognised, but simulators are often too expensive for medical schools in developing countries. Cheaper, locally-made models (or part-task trainers) could be the answer, especially when teachers are involved in design and production (teacher-made models, TM).

They evaluated the effectiveness of a teacher model in training and assessing intravenous injection skills in comparison to an available commercial model (CM) in a randomised, blind, pretest-post test study with 144 undergraduate nursing students. All students were assessed on both the TM and the CM in the pre-test and post-test. After the post-test the students were also assessed while performing skill on real patients. Differences in the mean scores pre- and post-tests were marked in all groups. Training with TM or CM improved student scores substantially but there was no significant difference in mean scores whether students had practiced on TM or CM. Students who practiced on TM performed better on communication with the patient than did students who practiced on CM.

These researchers believe that decreasing the ratio of students per TM model helped to increase practice opportunities but did not improve students' mean scores. The teacher-made model appears to be an effective alternative to the commercial models for training students on basic IV skills, as students showed similar increases in performance scores after training on models that cost considerably less than commercially available models.

They believe that these models could be produced using locally available materials in most countries, including those with limited resources to invest in medical education and skills laboratories.

It is highly motivating to learn through this study that inexpensive tools can be made locally available. The cost of skill laboratories can be prohibitive. Many countries in Arica, Asia and Latin America want to change the modus operandi of imparting education from conventional to modern technology, albeit the cost may be prohibitive. This study certainly provides guidance in this respect and acts as a model for developing countries.

Mittal et al. (2012) rightly pointed out that increased patient awareness, duty hour restrictions, escalating costs and time constraints in the operating room have revolutionised surgery education. Although simulation and skills laboratories are emerging as promising alternatives for skills training, their integration into graduate surgical education is inconsistent, erratic and often on a voluntary basis. They hypothesised that, by implementing the American College of Surgeons/Association of Program Directors in Surgery Surgical Skills Curriculum in a structured, inanimate setting, some of these concerns could be addressed. Their study involved 60 junior surgery residents who were assigned to the Penn Surgical Simulation and Skills Rotation. The National Surgical Skills Curriculum was implemented using multiple educational tools under faculty supervision. Pre- and post-training assessments of technical skills were conducted using validated instruments. Trainee and faculty feedbacks were collected using a structured feedback form.

The study demonstrated a significant global performance improvement, using Objective Structured Assessment of Technical Skills score for basic surgical skills (knot tying, wound closure, enterotomy closure and vascular anastomosis) and Fundamentals of Laparoscopic Surgery skills, $p<0.001$. Six trainees were retested an average of 13.5 months later (range, 8–16 months) and retained more than 75 % of their basic surgical skills.

So here is an example, a model, which can be replicated. The American College of Surgeons/Association of Program Directors in Surgery National Surgical Skills curriculum can be implemented in its totality as a 4-week consecutive surgical simulation rotation in an inanimate setting, leading to global enhancement of junior surgical residents' technical skills and contributing to attainment of Accreditation Council for Graduate Medical Education core competency.

This is exactly what can change the complexion of the training program completely. Part of the objective of any educational service is the smooth transition of a medical student into a practical life, duly trained and technically advised by the masters to achieve that goal.

Clinical skills laboratories have been established in medical institutions as facilities for Simulation-Based Medical Education (SBME). SBME is believed to be superior to the traditional style of medical education from the viewpoint of active and adult learning theories (Akaike et al. 2012). SBME can provide a learning cycle of debriefing and feedback for learners as well as evaluation of procedures and competency. SBME offers both learners and patients a safe environment for practice and error. In a full-environment simulation, learners can obtain not only technical skills but also non-technical skills, such as leadership, teamwork, communication, situation awareness, decision making, and awareness of personal limitations. SBME is also effective for integration of clinical medicine and basic medicine. In addition, technology-enhanced simulation training is associated with beneficial effects for outcomes of knowledge, skills, behaviour, and patient-related outcomes. To perform SBME effectively, not only simulators including high-fidelity manikin-type simulators or virtual-reality simulators but also full-time faculties and instructors as professionals of SBME are essential in a clinical skills laboratory. They rightly believe that the clinical skills laboratory is expected to become an integrated medical education centre to achieve continuing professional development, integrated learning of basic and clinical medicine, and citizens' participation and cooperation in medical education.

A comparison of modern and traditional aids in a nutshell

Skill laboratories

Skill laboratories have undoubtedly revolutionised medical education. They are state-of-the-art teaching and skills imparting avenues, but are quite expensive to provide.

They require expensive gadgets, manikins, specific logistics, trained facilitators, actors, trained subjects, etc.

Demonstrations/practicals

Merits: conventional and time honoured, efficient, practical, good to impart skills

Demerits: passive learning strategy, teacher centred, teacher controlled, dependent on teacher's quality

Standardised patients

Merits: extremely productive for higher domains, life experience, excellent for clinical skills

Applicable in many forms of curricula and instructions in a controlled environment

Demerits: expensive, requiring a regular supply of trained subjects, faculty training, and regular training of subjects

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4 Assessment and Evaluation

Assessment drives learning (George Miller 1919–1998). Evaluation and assessment together are two essential components of the curriculum (Cox et al. 2007). The objective of the former exercise is to compare the objectives with outcomes as to their acceptability. It helps fill the gaps identified in the mode of instruction and the curriculum. The latter, i.e. evaluation, defines the impact of the activity or exercise of curriculum on the faculty, students, health providers, etc (Reznick et al. 1992). Evaluation is a step towards identification of the completion of the exercise as to meeting the desired goals; following an exercise is a step towards future modification of the curriculum, which is a dynamic entity in medical education. It also advises the developers of the deficiencies, loopholes or shortcomings in the process of curriculum development.

Several steps have been describes by medical educationists in the processes of evaluation and assessment.

The component of *assessment* must match the teaching strategies as well as the objectives set up in the curriculum. Assessment of the students as well as the evaluation of the instructional program should both be done formatively as well as summatively.

*Formative assessmen*t usually involves identifying the potential scope of improvement through checking out the weaknesses. It does not gauge a student as pass or fail, nor should it affect the grading, and yet its role is immense as it allows deficiencies to be identified and removed.

Formative assessment is designed to monitor the learning process and its progress during the course of study. Its sole objective is to provide regular and, from time to time, feedback on achievement to all parties concerned, namely the students, their guardians and their teachers.

It can be used to monitor progress during a block, but preferably at the end of each unit of teaching, such as module or a block. The test given to the students is specially designed by the teachers and the examination committee. These days it is a lot easier as the questions specifically designed for certain exams are now available through professional publishers.

One specific form of formative evaluation is called diagnostic evaluation. It is performed using special procedures designed to assess a case of persistent or

S. Zaidi, M. Nasir, *Teaching and Learning Methods in Medicine*,
DOI 10.1007/978-3-319-06850-3_4

recurring fault and failure to improve, despite the employment of standard tools of formative evaluation. The eventual outcome of this format of evaluation should be the diagnosis of the cause and remedial measures required to correct the deficit.

Summative assessment is actually a make or break exam. It involves grading based upon actual performance of a student at the end of a term. Pass or fail or indeed meritorious achievement, etc. are all based upon the summative assessment. It therefore carries a huge value and must be taken seriously as it is high stake. The other aim of a summative evaluation is to evaluate the appropriateness of the curriculum and its objectives, and also the very course under application at the moment of assessment. The evaluation can be carried out during discussions, tutorials, workshops, community projects, community visits, family practice teaching, classroom teaching, museums, and practicals, etc. It is executed at the end of a semester ideally, but can also be carried out after a block or module.

Assessment can be either a self assessment, a peer assessment or a teacher-based assessment (Vu et al. 1992).

Learning occurs most effectively when students receive feedback, i.e. when they receive information on what they have (and have not) already learned. The process by which this information is generated is assessment, and has three main forms:

1. Self assessment
2. Peer assessment
3. Teacher assessment

Self assessment allows a student to evaluate critically his own performance and achievements over a period of time. He can then plan to fill in the gaps, improve upon existing knowledge and overcome any gaps in knowledge.

Peer assessment is more objective in nature and can help improve deficiencies through a more detailed analysis, but at times can be biased, if not really honest, though research negates it.

Then there is the classical, good old fashioned way of teacher-based assessment. It is conventional although many objections have been raised about it, such as personal likes and dislikes of teachers, bias, preference, prejudice, etc. This is one of the reasons why third party observational assessments are considered better than teacher assessment.

Regrettably, the educational pundits have not been able to formulate an ideal evaluation and assessment tool which is flawless. Many tools for evaluation are recommended by them. It is up to the faculty, and the medical education department to determine the one most suitable for their institution. Of course, it must comply with the accreditation body to permit and grant formal approval to a chosen exam.

Here are a couple of illustrations:

1. Project assessment. Tutorial/ community assessment
   Each student to be graded on a scale of 1–10
   Session, project, tutorial, community visit, a module:

   - Attendance and regularity
   - Active or passive in a group activity

- Knowledge: memory and recall
- Skills, practicals, clinical work
- Attitude, mannerism, ethics with patients, peers, teachers
- Log book

2. Module evaluation
   For the subjective evaluation of a module, the following formula may be used. The grading should be done at the end of a module, block or course. It is, however, up to the faculty to decide whether they want to do a random sampling during the period of instruction. A sample could comprise a few students or the entire firm, batch or class.

   Grades could be graded on a scale of 1–5

Very poor	1
Poor	2
Satisfactory	3
Good	4
Excellent	5

The parameters for assessment are:

Course: well designed, objectives clear and precise
Learning objectives achieved
Instructional strategy matched the desired objectives
Learning objectives clearly conveyed to the pupils
Assessment relevant to the desired objectives
Economy and suitability of time allocated for the module
Active learning, group leadership, active debate, interaction, group activity
Logistics
Learning resources and their availability
Student satisfaction

3. Tutor/facilitator evaluation
   There are many ways to assess and evaluate a teacher/facilitator. Here is a simple and straightforward model to use or modify:

   The grading once again could be:

Poor	1
Adequate	2
Satisfactory	3
Good	4
Excellent	5

The parameters for assessment are:

Communication skills, speech, eye contact, body language
Concept and thought process
Relevance to the topic
Teaching aids/slides/black- or white board/charts/OHP

Presentation skills
Motivation
Student involvement
Ability to connect with the audience
Ability to respond to queries
Attitude, mannerism

The students and sometimes independent observers can grade the facilitators, tutors and teachers, which goes a long way in the faculty development and achieving good results by the students.

It is of particular relevance to the institutions engaged in preparing their students for international exams such as the USMLEs and PLAB, etc.

Typically these experiences include attendance at lectures and classes, work in small groups, private study, preparing work for assessment and so on.

In the triangle of education, i.e. curriculum, teaching strategies and evaluation, the third limb is the main measure for assessing if the content of a syllabus and instructional strategies are indeed productive and adequate enough to achieve certain learning objectives.

Evaluation is a process, confined to a classroom, involving a group activity, concentrating upon discussion, cooperation, interaction, verbal communication to express effectively, and focusing on achievement of grades (Wilkinson and Frampton 2004).

Historically, medical students have been evaluated on two fundamental principles of education, i.e. memory and recall and problem solving. No consideration was given to such attributes as medical ethics or communication skills. Until the 1960s, students were asked to take a history and perform a clinical examination. They were asked a few theoretical questions which they answered in the shape of a long essay, and answered questions asked by the examiners in a viva voce. This was a standard practice and no one objected to it as it served the purpose of both individual and collective assessment. Communications skills had no part to play. Those were the days of a paternalistic approach in medicine. The doctor was always right. He knew it all, and the patient was at his mercy in terms of decision making. They were good times for the doctor but not for the patient, as some unscrupulous doctors used their knives to experiment on their patients.

The role of doctor-patient relationship has since become an integral part of medical education, hence an examination (Harden 1988). However, how do you measure an individual's communication skills in a viva voce. Well you can't, though you can do so in a practical examination where the student demonstrates his skills in a clinical exam. That has now become difficult, as direct examination of a patient in an exam is not always easy. So the role of simulation, structured and embedded subjects has come into play as a major role in a medical graduation examination.

Norcini et al. (2011) have described seven components or criteria of a good assessment tool. They are (1) validity-coherence, (2) reproducibility-consistency, also called reliability, (3) equivalence, (4) feasibility, (5) educational effect, (6) catalytic effect and (7) acceptability. The Ottawa Consensus Statement 2010 has also classified "state-of-the-art assessment" into three categories that rely on the existence/absence of evidence-based research. These categories are areas where practice is consistent with evidence (category 1), areas where practice is not yet consistent with evidence (category 2) and areas where there is a lack of evidence (category 3).

Amongst the seven components listed above, the two essential and more commonly carried out measures of performance in the process of assessment are:

1. Validity
   This is defined as the degree to which the inferences made by competence based on assessment scores are correct (Messick 1989).
2. Reliability
   This is a measure of the relative magnitude of variability in scores due to error, with the aim of achieving a desired level of measurement precision (Shavelson and Webb 1991).

GMC has released noteworthy documents for the medical schools to seek guidance from and applying their institutions in the context of reliability and validity.

Equivalence is another measure to be carefully observed in selecting the assessment tools. Since most tests are given to multiple people at varying times, different versions of the same test may be required .However, if their difficulty is harder than the standard, then their validity may be questioned. So the test has to be equitable, with a similar degree of difficulty, but different wordings or paraphrasing, and should be weighted on a given scale to ensure uniformity. This process of equating requires specialist tools employed by professional examiners.

The traditional system of preclinical examination comprised theory papers, combined with practicals and viva voce. In clinical exams it was once again the combination of theory papers in the form of essay writing and clinical exams as short and long cases. The short cases allowed the examiners to assess the instant diagnostic ability of a student through a process of quick data analysis and critical thinking. The long case, on the other hand, allowed the examiners to evaluate a student's ability to communicate with the patient through a process of interrogation, interviewing and collection of important and relevant information. It was followed by a critical evaluation of physical and clinical examination, diagnostic evaluation and problem solving through a process of elimination of possible contributors arriving at a definite diagnosis.

This exam was always supplemented with a table viva voce, spotting and identifying various instruments employed in clinical management, identification of museum specimens, etc. The process was designed to correlate various components of desirable learning experience, and to assess the level of competence required to move on to the next stage.

4.1 Tools of Assessment

George Miller divided the tiers of assessment into four domains (Kern et al. 2009; Miller 1990). They are:

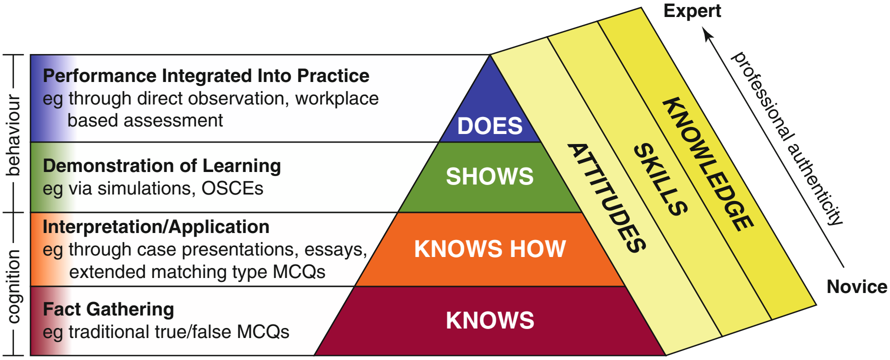
1. Know
2. Knows how

3. Shows
4. Does

There are a few standard and time tested versions and some modern and latest methods of assessment. Below is an illustration to give an idea of the options available in the context of tools of assessment for the three different domains of learning, i.e., cognitive, affective and motor.

It must be remembered that each tool has its own validity and reliability. In addition, elements like feasibility, practicality and costs incurred in the application and usage of these tools has to be borne while choosing any instrument.

MILLER'S PRISM OF CLINICAL COMPETENCE (aka Miller's Pyramid)
it is only in the "does" triangle that the doctor truly performs



Based on work by Miller GE. The Assessment of Clinical Skills/Competence/Performance: Acad. Med. 1990: 65(9): 63-67
Adapted by Drs. R. Mehay & R. Burns. UK (Jan 2009)

Essay writing is the most original format. It has been standard practice for a century or longer (Liu et al. 2013). Each essay can extend from 30 min to 1 h, depending upon the number of questions asked. The primary focus of an essay rests with in-depth evaluation of one particular topic within a subject. For instance, it could be a question asking for the detailed anatomy or physiology of a particular organ in the abdomen. Or in a clinical setting, say, asking about a duodenal ulcer, breast cancer, etc. The purpose is duly served as the question demands various subjects to be covered within a given period of time. It could ask for aetiology, pathology, signs, symptoms and management of, say, a duodenal ulcer in a man of 35, etc. So the whole principle is based upon knowing what the student knows about one particular topic. Traditionally, there would be four or five questions in a 3-h writing session. Usually the option of an extra question is given. Frequently the examiner or paper setter would ask for a few short notes instead of one long essay. This is akin to what is now called a short essay question.

The advantages of the long essay write-up were manifold. It allowed the evaluation of the candidates' knowledge base through the process of memory and recall. It also allowed the examiner to judge the writing skills and the power of expression. For many students in the developing world, where English is the only academic medium of expression, it was always difficult for some to write a long essay truly reflecting their knowledge base. Many times there would be some students who could solve a conundrum in their local language but not be able to express it in English. Obviously this dilemma was unheard of in Western circles. In fact, what was worse, and continues to remain so as we write, is that the students of O and A levels in non-English countries are subjected to the same standard of English and maths, etc. as those in British schools. What is amazing to note, however, is that some students would get stars in all their subjects. Many such students have gone on to lead the major institutions in the US and other countries, despite the natural handicap of having to learn in a foreign language.

This drawback was particularly obvious in higher exams such as Fellowships and Doctorates. Obviously the long essays were more of a problem than other forms of written exams.

Another major problem was that only a small portion of the subject could be covered in those five or six questions. So one would often see repetition of the same questions over the years. It became routine practice amongst the students to base their exams on solving guess papers developed by some professional pundits.

Finally, when it came to checking the papers, it was often noticed that the examiners had not gone through all those lengthy written answers, thus missing out some salient points. After all, who could go through thousands of pages of similar material in a few weeks! Stories were always circulating about discovering the written papers in a remote shop of a part-time examiner or some shadowy character marking those papers. How pathetic is that!

The curriculum designers must give full consideration to all kinds of prospective candidates, including those with special needs. As a matter of fact, great emphasis is currently being laid upon the educational needs of the disabled to preserve their dignity by enabling them to earn their own livelihood through respectable means. They should also be above all forms of bias of race, religion, colour or caste. Equality and affording equal opportunities to all must remain the motto.

The curriculum must also take into account the role of the major stakeholders in its implementation. These stakeholders are the health authority, the community, the physician and the student.

Of all these partners for whom a curriculum is important, the most affected are the public and the patients. Then it is the students hoping to become doctors to serve the community, then the physicians who obviously play a major role in the implementation of a curriculum and finally the health authorities.

However, for some inexplicable reason, it is the health authority that dominates the scene. They determine the best or most suitable curriculum for a given community. They are responsible for the health care of the common citizen, and while the academicians are focused on scholarly pursuits, the politicians and their cohorts, i.e. health ministers, etc. know better of the outside world and any changes occurring elsewhere.

Even now we hear of stories of ghost writers or professional copy writers who write a whole thesis for money. They even advertise their services on the web. Dishonesty has no limits!

The alternative to essay writing was found in the early 1970s in a new format called the Multiple Choice Question (MCQ).

MCQs became very popular due to the unpopularity of essay writing as they were supposed to cover the whole subject across its length and breath (Norman et al. 1982). The shallow knowledge base which was the critique on essay writing was presumed to be covered in MCQs, but this is not true. No doubt a larger component of the subject was covered in the form of several smaller questions, but the answer was confined to a few answers to each stem. They are asked as a single stem with several matching answers, asking the student either to choose the best or to choose between true and false.

The pattern is universal, but more examiners prefer to ask the respondent to select the best response to a given statement in the question. Obviously the replies are already mentioned, so it was a question of guessing the best possible response if one was not absolutely certain.

MCQs continue to prosper for many reasons, such as economy of time, wider coverage of the subject and the application of computers in assessing, thus saving manpower and eliminating human bias, a major drawback in essay writing.

The problem with MCQs is mainly in terms of designing appropriate questions, which could be quite demanding and labour intensive. Besides, the question developers had to be trained to write such questions as to meet all requirements. It is the job of the department of medical education to maintain a regular supply of the MCQs in the bank.

MEQs (Modified Essay Questions) were introduced to compensate for the deficiencies in long essays. They are still in vogue and often employed in both undergraduate and postgraduate exams. MEQ comprise a statement of a clinical scenario followed by a couple of questions, which in turn will generate a few more questions. This is followed by the release of more data followed by a question, eventually ending up in a stepwise question and answer session, written in a narrative style.

MEQ have the advantage of covering a particular subject quite thoroughly, and the student does not have to suffer the ordeal of lengthy answer writing nor the evaluator suffer the trauma of reading long passages of monotonous description.

The Short Essay Question (SEQ) is another format in which 10–12 questions are asked with a response time of 10–15 min for each question. It serves the purpose of covering a fairly large component of subject in a shorter duration of time. The SEQ has the advantage of essay writing without overusing resources in terms of time and money. What is covered in 3 h through 4 or 5 questions could be broken down into 10–12 shorter questions, allowing a wider subject content to be covered.

Then there is another format of evaluation called the Short Answer Question (SAQ) (Newble 2004). The student has to reply in a couple of words to the questions which have to be chosen from a given list of choices. So it is akin to the MCQ in terms of covering a wider core content than essays and more precise in response. It also allows the examiner to set questions covering the core and the basic knowledge without giving a cue. University of Dundee has adopted this innovative format in its medical school. Professor Harden is a globally recognised personality in the field of medical education, who has pioneered many innovative methodologies in this field. He headed the department of medical education at Dundee, and is a strong supporter of SAQs.

4.2 Extending Matching Questions (EMQs)

Extending Matching Questions (EMQs) are an innovative way of assessment. This is an alternate way of checking out the performance of students to MCQs. A clinical scenario is given with several related responses, for the student to choose the most appropriate responses without the advantage of a cue as in MCQs. For instance, a patient presenting with an acute coronary disease with the relevant clinical signs and symptoms. The response sheet would contain ECGs or cardiac enzymes for the student to match by selecting from a list of many options.

This form of evaluation is computer-based, thus saving human endeavour in the process of evaluation, although much effort may be required to prepare the questions.

4.3 Objective Structured Clinical Exams (OSCE)

Objective Structured Clinical Exams (OSCEs) are conducted in a standardised environment through a planned or structured approach with the examinees undergoing evaluation of similar tasks with similar patients and simulators (Petrusa et al. 1987; Coderre et al. 2009). These examinees are assessed by the same examiners in the same time. They are used to assess medical knowledge, patient care, professionalism, communication and interpersonal skills, practice-based learning and improvement, and systems-based practice at all levels of medical education, including under- and postgraduate levels and continuing medical education. They succinctly capture the true spirit of Bloom's and Simpson's taxonomy by way of their applications. Currently, more than 107 schools have made it mandatory to pass Step I of the United States Medical Licensing Exam (USMLE) before graduation. Canada has a stringent system of licensing its own medical graduates and those from abroad (International Medical Graduates or IMGs). It relies heavily on OSCE for the MCCQE II, is a component which looks at the clinical and non-clinical attributes of doctors. The training program for any specialty in the UK is 5–8 years long, not counting the first two foundation years. OSCE is used as part of the exit exam in a vast majority of these specialities. Other countries are also rapidly adopting OSCE for their national licensing exams and for assessing IMGs, both as a result of the stakeholders' demand for valid and reliable assessment tools and students' feedback on their greater acceptability.

Face validity deals with the ability of a test to measure a trait which it has been constructed to measure (Blike et al. 2005). OSCEs are thought to have good face validity as the standardised patient (SP) encounter mimics a real doctor–patient encounter quite closely (Marshall et al. 2001). Despite numerous changes in OSCE since its inception, earlier researchers have also concluded that their findings are congruent with the more recent ones. Use of SPs requires their continuous and updated training, pilot testing and steady feedback to the test designers as otherwise the face validity is threatened.

Content validity describes the degree to which the OSCE covers the area of competence in question (Wayne et al. 2008; Yaeger et al. 2004). The first step of achieving it is to identify the clinical and non-clinical issues which need testing for competency. These tasks are then broken down into sub-tasks and the expectations from examinees identified. A blueprint of these domains is constructed where the problem to be tested lies on one axis (e.g. for abdominal pain, rash in a child, breaking bad news) and the competencies expected on the other (e.g. for history taking, physical examination, communication skills). Reznick et al. examined the validity of OSCEs by administering post-examination questionnaires and grading the responses on a scale of 0–10. Vu and Barrows looked at six cohorts of clinical clerks and reported good content validity. Similar findings were reported by van der Vleuten and Swanson who observed reliability and various types of validity of about ten large data sets. The examiners found these tests appropriate for judging the participants' skills.

When a measurement tool is able to discern between an amateur and expert learner, its ability to do that is attributable to its construct validity (Parr and Sweeney 2006). It is so called because a construct underlies any outcome being measured by a particular test in any type of measurement (e.g. for the outcome being the ability to differentiate between the two groups of amateurs and experts). Construct validity is complex and is not operationally defined. Some researchers have used internal consistency and test-retest reliability as evidence of this type of validity. OSCEs have been documented to have adequate construct validity.

It can be concluded that validity remains a dynamic process which continues incessantly with the researcher collecting data, analyzing it and then modifying the pre-existing instrument to a better one in light of the results of the research.

As stated earlier, reproducibility or consistency refers to the reliability of a test. It is the extent to which students' scores in context of time, sampling and factors related to test administration are reproducible and consistent from one assessment to the next and from one item to another. It is expressed numerically as a coefficient called the reliability coefficient. Any value around 0.8 and above is deemed to be good to excellent. Nayer et al. have reported 0.6 to be a "good" level of inter-rater reliability. Historically, 0.7 is taken as an acceptable level of reliability.

The reliability of OSCE is influenced by certain factors. One early review noted that, to a great extent, *examinee* performance (test-retest reliability) varied from one OSCE station to another (Cooper and Taqueti 2008). Another review reported that certain *exam-related factors* influenced the reliability of an OSCE. These included the effect of raters (inter-rater reliability), the number and length of stations (inter-station reliability) and the use of checklists vs global rating scales for assessment (internal consistency). These pieces of research have mostly reported reliability coefficients as Cronbach's alpha (α) or the generalisability coefficient (Ep^2).

Ideal internal consistency is reported to be 0.7 (McGaghie et al. 2011). It improves with an increase in the number of stations and is higher when similar skills are being tested instead of diverse ones. It is also influenced by the rating tool and examiners. Items within a station tend to correlate more highly than similar ones across the stations. This is called case specificity. Although acceptable levels are achieved with as small a number as 8, sometimes even 20 and more stations do not guarantee adequate coefficients. This points to the fact that just having a recommended number of station is not enough to guarantee the reliability of a test. There are several grey areas in the research on internal consistency which prevent one from explaining a particular reporting. For example, in one piece of research it was reported that the data was collected over several cycles but no report was made on the nature, dimension and year of station evaluation.

Standardised patients (SPs) when used as raters also influence internal consistency. They are non-physicians trained to portray accurately and consistently patients in a simulated clinical situation. They provide feedback and can be used to simulate scenarios which are uncomfortable and distressful to the real patient. They also provide uniformity in the assessment of students. Licensing exams in Canada, USA and the UK routinely utilise SPs for testing clinical competence in an OSCE setup. They are also used in many local exams by medical schools and programs at undergraduate and residency levels. A number of research projects have reported on SP-based OSCE. Paediatric SPs have been reviewed at length by Tsai who reported the reliability to be between 0.34 and 0.6. Tsai has recommended that, although they have adequate reliability, validity and quality of feedback, they should only be used when there is no other option for assessing the students as otherwise this is deemed unethical. Reliability is less influenced if it is made sure that only one SP is used per station and all of them are well-trained in using the checklist or the global rating scale. It has also been suggested that the language used in checklists should be easily understood by the person portraying the patient and does not contain jargon.

Feasibility of OSCE has been reported as the main objective of many research projects. The cost of implementing them is high in terms of personnel, facilities, finances, recruitment, training and retention of SPs and faculty observers and test development and maintenance of available clinical space to carry out the exercise (Rothman et al. 1996). Despite these factors, a vast majority of research projects have reported OSCEs to be extremely realistic and practical. Cusimano et al. have reported the cost of a six-station OSCE conducted in the early 1990s at the University of Toronto Faculty of Medicine where 300 h of staff and faculty time were required for each rotation (8.2 h per student) and direct expenses for the OSCE amounted to US$6.90 per student per station. These were significantly small compared to some figures reported later on. Other research reported that it required 300 h of clinical faculty time per year to set up and conduct an OSCE exam in the medical school of principal investigators. Around US$1,150 were spent on materials used for the examination such as models. Replacing worn or damaged models and paying simulated and actual patients participating in the OSCE exam added to the cost. Additionally, the clinics and examination rooms were kept engaged to conduct an OSCE for a number of hours.

OSCEs can be expensive at a personal level as well. When the licensing exams for family physicians in Quebec started in 1990, collaboration of over 350 faculty members and organisers was required to administer the exam the first three times. Each candidate had to pay CAD $650 to take the OSCE and that accounted for 60 % of the cost. A research project from Ireland reports larger figures. Standardised patient costs totalled €960 (one CAD equals €1.52). Administrative costs totalled €314 and the total cost for the portion of the OSCE that assessed communication skills was €7,223. Although the corresponding cost per student was €102, all in all OSCE proved to be quite expensive at €7,223. An interesting reporting is that by

Petrusa who stated that dollar cost estimates included \$200 minimum per student for acceptable reliability of 0.7 in an OSCE exam and hourly costs of \$15 per student.

Despite the monetary implications and costs in terms of time spent in the hiring and training of personnel and appropriate clinical settings, OSCEs have been administered in most US medical schools, many residency programs, and by the licensure boards in Canada for many years (Shatzer et al. 1993). They are also used by the General Medical Council, UK and the Australian Royal College. Because of its high fidelity, students mostly find it engaging and less stressful than other types of performance-based exams such as the bedside patient encounter for formal assessment of clinical skills. The practical implications of this type of assessment seem to be justified when its reliability is compared to other traditional tools.

Assessment is beneficial for the growth of learning when its content and format are congruent with each other (Norcini and McKinley 2007). In addition, the programming and examination regulations also have to be in alignment for the learning to reach its full potential. The majority of the students find OSCEs realistic and the content appropriate for testing a wide range of competencies. Students also find it fair, engaging and objective. Gordon and colleagues found the acceptability was high and yielded effective changes in the skills of the healthcare professionals when it was used for the assessment of a team-based approach to a scenario. Newble et al. have reported on data collected over 8 years and have found very high levels of acceptance by both the students (>90 % were satisfied or very satisfied) and the 39 examiners (none showed dissatisfaction). Jefferies reported similar trends amongst the examiners and the students in their OSCE on CanMEDs roles. Despite the positive feedback on the acceptability of OSCE, it must not be forgotten that some students find the exercise stressful; this can be alleviated by offering them continuous feedback through their training, helping them improve their interviewing skills and exposing them to a variety of patients.

The field of assessment is ever-expanding and medical educators continue to design, implement and validate methods and tools that fulfil the criteria of good assessment in the light of best evidence (Barrows 1985). The focus of assessment has shifted from just being student/program-oriented to now being patient-oriented as well. Although it is a fact that OSCE has brought a remarkable change in the method of mastering clinical competence by bringing the students out of the libraries and into a (real or simulated) bedside environment, it is also a fact that the debate in favour of or against the OSCE requires a bargain to be made between its conveniences and inconveniences. Research has demonstrated that OSCE does conform very strongly to at least three of the components of a good assessment tool as laid down by Norcini et al. in the Ottawa Consensus Statement 2010, i.e. validity, reproducibility and feasibility. Research also gives evidence in favour of equivalence and acceptability of OSCE but it is still terse in respect of its educational and catalytic effects. It is the authors' belief that, until such time as OSCE is established as a "gold standard" for assessment of clinical competence, a balance will need to be maintained between OSCE and other tools of assessment for evaluation of performance. It is encouraging to note that, despite the issues of reliability, validity and logistics, OSCE remains a favoured choice by most medical schools and licensing authorities for high-stake exams, which adds to its credibility. Like other assessment methods, successful OSCEs are always the result of extensive planning and commitment and collaboration of a number of people.

Future directions in terms of research point towards a need to validate the educational and catalytic effects of OSCE. Ways and means to cut down on the costs and improvement of logistics are other aspects worth further exploration. OSCE, meanwhile, continues to satisfy its stakeholders, both at an individual and a program level.

4.4 Evaluation in Simulation

The subject of simulation is introduced in a previous chapter. With a shift in paradigm from pure bedside teaching to also providing care to the patient, more and more medical schools are looking for innovative ways to enhance the effectiveness of delivery and evaluation of curriculum. Students still feel that they are unable to make a connection between what they learn in a classroom and see in a ward. With a rapid growth of technology-enhanced means of assessment in health professional education, simulation is becoming an answer to these concerns in many ways.

Simulation has been defined as the technique of imitating the behaviour of some situation or process by means of a suitably analogous situation or apparatus, especially for the purpose of study or personnel training It allows the learner to experience mistakes and receive feedback in a safe environment and is a true reflection of the Hippocratic Oath, i.e. “First do no harm” as it gives students an opportunity to practice their skills without any chance of bringing harm to their patient. It has a huge role in medical education and has been utilised in teaching and learning in its most basic form for centuries. Long before computers were invented, anatomy models were being used to develop an understanding of the human body. By the 1900s, medical education was rapidly progressing from the apprenticeship model towards more scientifically-based methods. Soon stakeholders began to question ways and means of assessment of competence in the domains of knowledge, skills and behaviour. This was consistent with the concept of “deliberate practice”. This concept had actually existed in the military and maths already. It is felt that the progress of human patient simulation which was observed in the beginning of the twentieth century was a revolutionary step forward in health science education.

Simulation has been divided into five types. These are *verbal*, *standardised patient* (*SP*), *part-task trainer*, *computerised patient and electronic patient or human patient simulation* (*HPS*). The most advance and comprehensive form of simulation in medical education is the electronic patient which is either virtual-reality-based or a manikin and involves the simulation of the environment as well.

As technology is leading the way in practically all fields of life, it is quite understandable that similar changes are also warranted in health profession education. Simulation is being increasingly used to assess the first three levels of Miller’s pyramid. This is attributable to its ability to program and select learner-specific findings, conditions and scenarios, provide standardised experiences for all examinees and include outcome measures that yield reliable data. HPS has documented applications in anaesthesia, internal medicine, emergency medicine, paediatrics and neonatology, obstetrics, pharmacology and crisis management. It has been used for both instruction and assessment. The facets of acute life-threatening emergencies requiring the pursuit of algorithms and protocols, technical skills, interprofessional education, and team working for crisis management have been specially focused upon by this mode of assessment, for both formative and summative assessments. Simulation has a special role in preventing the erosion of skills and knowledge in all specialties in which it has been used. Research has shown that, with the passage of time, knowledge and skills in the context of cardiopulmonary resuscitation wane and require frequent refreshers courses as boosters. High-fidelity human patient simulation has been shown to be of benefit while assessing medical personnel for retention of skills after the lapse of a certain period of time. This is attributable to its principle of repeated practice.

With technology-based assessment becoming commonplace, it is expected that some aspects of these assessments will present themselves as challenges for test developers and administrators. One of the biggest and most commonly issues encountered is that of *fidelity* of simulation. Fidelity is a measure of the closeness of a model or a situation to reality, and is known to influence strongly the assessment of students when simulation is involved. The higher the fidelity, the more engaging the process for the examinee, leading to a positive educational effect. Another substantial challenge slowing down the widespread use of simulation for assessment purpose is the *feasibility* of the setup. Not only does it include the cost of manikins, it also encompasses the monetary and resources expenditure of the simulated environment. *Giving effective feedback and debriefing* is another challenge. Other factors which have been identified as significant obstacles in the path of simulation for assessment include *lack of training and development of faculty* and *ethical concerns* when a wrong construct might be measured because of the overpowering fidelity of the simulator (e.g., for expertise at the usage of technology rather than the technique of endotracheal intubation) or heightened feeling of self-reliance by the learner because of remarkable performance in an assessment scenario.

The biggest challenge involved in using simulation is ensuring its fidelity. Fidelity of simulation may be defined as the degree to which a model or environment of simulation reproduces the state and behaviour of a real world object, feature or condition that http://en.wikipedia.org/wiki/Fidelity-cite_note-0#cite_note-0 can progress from low to high on a continuum. Fidelity can be physical or psychological. Physical has to do with the realism of the simulator and the environment and psychological is concerned with the degree to which simulation replicates psychological factors, such as stress and fear, which can be experienced in the real environment.

Simulators can be low fidelity where the learners are given the opportunity to practice the necessary skills in isolation, e.g. for measuring blood pressure, intravenous cannulation or urethral catheterisation. With moderate fidelity simulators, the scenario is closer to reality but the intervening commands or statements so vital for better fidelity are still missing and, hence, the learner does not lose himself completely in the situation. An example would be that of a manikin with breath sounds but without chest movements. High-fidelity simulators are involved where maximum effort is made to bring the clinical case scenario as close to reality as possible. This is achieved by using manikins that mimic real life gestures such as making eye movements, jaw movements and responding to manoeuvres being carried out by the trainee in the form of changing breath and heart sounds, alterations in the haemodynamics of the body in response to a drug administered and reverting to life after a cardio-pulmonary arrest. High fidelity simulators are especially desirable for teaching and assessment in acute life-threatening scenarios and places where critical decision making is required because the student then considers himself part of the situation and makes decisions without feeling threatened to be in a spot where his practice might be unsafe for the patient. For this, though, he must be committed to engage and be very clear about the task at hand. He must also be fully aware of the capacity of the simulator. The feedback provided by the assessor must be minimal during the actual process of simulation and should follow the assessment observation. The assessor must also stay out of sight until the simulation has finished.

In addition to the human factors, higher fidelity simulation is achieved by ensuring that the environment where simulation is carried out mimics the real setting very closely. Hence, the design and layout of the resuscitation room, for example, must match with the real hospital resuscitation area, all the equipment must be close to reality and all types of documentation should be carefully duplicated. This degree of realism sometimes becomes hard to achieve, especially in context of the "feel" of the simulator. Some have reported on a lack of the feel of the skin, skin colour and skin temperature. Others have experienced and reported on the lack of realism as simulation is limited by the degree of closeness it can achieve to the actual environment. As the simulated scenario may be fast-paced and stressful, as in the case of an acute cardiac emergency, there is no guarantee that the student will emulate the simulation in the real situation as well. Breakdown of the simulator and other technical faults affecting the smooth running of a scenario also impact simulation, which hinders the expansion of HPS as a well-accepted tool of assessment.

In the field of acute emergency medicine and paediatrics, a substantial amount of research in studying fidelity has been done with reference to resuscitation. Campbell and colleagues have reported on a formative assessment which took place after the neonatal resuscitation program. The Neonatal Resuscitation Program (NRP) is an educational program of the American Academy of Pediatrics and the American Heart Association for training healthcare providers in both the knowledge and practical skills of neonatal resuscitation. They compared a high-fidelity manikin (SimBaby by Laerdal) with a low fidelity one (ALS Baby). The experience was rated as higher for SimBaby than for the ALS one ($p=0.026$). In addition, less directions were required during the Megacode by the group learning on the SimBaby ($p=0.015$).

Regarding the feasibility, both the cost of equipment and the lack of faculty time are practical elements that form barriers when utilising simulation for assessments. As many of the technologies involved are expensive, smaller centres and medical schools struggle to adopt this novel mode. Depending on what level of fidelity is warranted, the price of simulators can range from $200,000 to $300,000 which expands further when the cost of equipment maintenance, laboratory space and training and hiring of faculty is added. Unfortunately, research has mostly not concentrated on this aspect of feasibility. Lee and Grantham have reported figures of $20,000–$50,000 along with expenditure of faculty time. Blike has reported on the costs incurred on formative assessment exercise in paediatric sedation and anaesthesia. The simulator cost was $120,000, which was further increased due to measures implemented for increasing the fidelity of the simulator. Two hours were required to set up the whole exercise and 2 h to run one session. One hundred man-hours were spent on scrutinizing the scenario and equipment for adequate validity. In one piece of research conducted in nursing education, researchers have reported costs incurred as $20,000–$50,000 for the maintenance and upgrading of equipment. They also highlighted that only a small number of students can be assessed at a time on simulators, sometimes only one. Some research has also pointed out faculty's concern about the need for their investment of additional time and resources.

One way to cut down on the cost of simulation and improve faculty hiring is by getting several centres together to form larger multidisciplinary institutes for simulation with facilities which may be used by other smaller schools. For faculty as well, a similar approach can be adopted where it is hired to run an exercise for which they receive protected time, promotions and remuneration as incentives.

4.5 Ethical Concerns in Simulation

There are several ethical concerns which need addressing in the context of simulation, both in paediatrics and other fields of medicine. From what has been gathered from the feedback of students, when put in a crisis situation, albeit simulated, there is a state of heightened awareness and anticipation of oncoming events. Haskvitz and Koop noted "Students may aggressively tune into the possibility that something is about to happen and become overzealous in treating a situation". On the other hand, Henrichs has reported that students have extremely high levels of anxiety. If a patient-related crisis occurs in real life, students felt they handled themselves better than they did on their respective simulation scenarios.

The participants also described a feeling of intimidation on acknowledging the presence of video cameras, evaluators, co-actors and limited flexibility of the programmed scenarios to accept any other alternative of managing a patient than the one documented in the tool of assessment, e.g., for a checklist. A dangerous drawback of this is that students are false-negatively meant to feel that they are not competent enough when in a clinical situation they actually are.

The element of humanness is lacking in human patient simulation. They are plastic in appearance and, even with voice generation, do not seem completely real. Greenberg et al. ran programs where standardised patients are incorporated into the scenario and utilised up until the point actual procedures started.

Issenberg, McGaghie et al. pointed out another area of concern for simulation technology. They have commented on the fear that technology will dehumanise health care as students spend more time in simulation laboratories than at a patient's bedside. However, it cannot be denied that HPS places better-trained doctors at the patient's bedside.

Because simulation is all hands-on, it is felt that it makes the learner over-rely on the technology. Yet, to be a good doctor, one requires other competencies such as empathy and altruism, which have not so far been shown to have been assessed validly by HPS. Over-reliance on technology also leads to the wrong constructs being measured. A high-fidelity simulator with a closely-mimicked environment can misguide the student into thinking it is his technological skills being assessed rather than clinical. All these issues are easily resolved by striking the right balance between simulation and real life.

4.6 Debriefing

Debriefing is a vital part of human patient simulation. It is usually carried out in a four-step process put forward by Rudolph.[73] These steps are (1) identifying the shortcomings in the performance in relation to predetermined objectives, (2) giving a description of the identified shortcomings, (3) researching into the causes of these gaps in performance and (4) putting a plan in place and carrying out the suggested remedial measures to overcome these shortcomings. Students must discuss what they achieved, how it all felt and how they could improve. It was found to be effective in a study by Leflore. Other research looked at the difference between oral and video-assisted debriefing but did not find any differences between the two. Because it takes up a lot of faculty time and requires complete engagement of the learner and the assessor, its effectiveness sometimes decreases and does not lead to adequate learning. Ventre and colleagues have documented the use of video-assisted technology successfully to address this concern, unlike the previously-quoted group.

As technology advances, one would think there would be less need of trained faculty. Technology, in fact, has not obviated the need of trained assessors as simulation can only augment and not replace the conventional educator.

Human patient simulation requires the development of formally trained faculty who are able to manage the simulator and the environment. Sometimes they have to double up as actors, technicians and counsellors during these exercises. They also require special skills to carry out the task at hand realistically. Some of them may find the required amount of work and commitment overwhelming and fearsome. Good et al. have reiterated the same notion in their research. Lasater has noted similar findings when feedback was taken from nursing students who felt it would have helped if the faculty was well-developed during their assessment with simulation. Euliano has rightly pointed out that successful simulation is not possible without the presence of an enthusiastic, well-trained facilitator who can guide the confused and encourage the others at the appropriate time in the right manner. Gaba feels that the biggest investment in simulation is that of faculty development. Other researchers have echoed the same findings. Adler and Trainor have described the ability of their program to sustain the training of more than two facilitators for their program which affected their research findings. As highlighted elsewhere, the lack of enthusiasm in faculty to invest time in honing their skills and offering their services can be encouraged by protected teaching time, appropriate remuneration and incentive for promotions.

To conclude, regarding simulation, assessments are vital for establishing learners' competencies, for recommending and bringing about curricular reforms and for the credibility of the educational institute. It, hence, becomes unquestionable that the assessments are feasible, credible and accurate. Cost, logistics, engineering hurdles, shortage of time and ethics are some of the elements which influence the fidelity of simulation and lead to a hindrance in the exact duplication of the "real thing". Although its role in assessments, especially high stake exams, remains largely undetermined, wider use of high fidelity simulation is welcome. It is also not worth splitting fidelity into its various grading as maximum benefit can be reaped by using assessments at different levels of a continuum of fidelity from low to high.

In the future, research may be directed towards refining the assessment instruments to improve their reliability and validity. Another aspect which needs further exploration is establishing actual costs in terms of equipment, space, faculty salaries and time and resolution of ethical dilemmas in HPS.

In the triangle of education, i.e. curriculum, teaching strategies and evaluation, the third limb, is the main measure for assessing whether or not the content of a syllabus and instructional strategies are indeed productive and adequate enough to achieve certain learning objectives.

Assessment is a process, which is an exercise between the faculty and the students. The purpose of this activity is to determine the efficacy of the teaching exercise of a given core content in a given period of time. It is a way of determining the response achieved through the effort of the teachers, the Dean, the administration, etc. in transferring the knowledge and technology to the students.

It is a process which determines the effectiveness or otherwise of the teaching and learning activity, its methodology, objectives and learning environment. It also enables the educationists to assess the level and the degree of teaching and learning, to adjust the levels as and when required, and to improve learning and reading habits. This activity is learner centred, course centred, curriculum based and ungraded.

Evaluation is a process, confined to a classroom, involving a group activity, concentrating upon discussion, cooperation, interaction, verbal communication to express effectively and focusing on achievement of grades.

Historically, medical students have been evaluated on two fundamental principles of education, i.e. memory and recall and problem solving. No consideration was given to such attributes as medical ethics or communication skills. Until the 1960s, students were asked to take a history and perform a clinical examination. They were asked a few theoretical questions which they answered in the shape of a long essay, and answered questions asked by the examiners in a viva voce. This was a standard practice and no one objected to it as it served the purpose of both individual and collective assessment. Communications skills had no part to play. Those were the days of a paternalistic approach in medicine. The doctor was always right. He knew it all, and the patient was at his mercy in terms of decision making. They were good times for the doctor but not for the patient as some unscrupulous doctors used their knives to experiment on their patients.

The role of doctor-patient relationship has since become an integral part of medical education, hence an examination. However, how do you measure an individual's communication skills in a viva voce. Well you can't, though you can do so in a practical examination where the student demonstrates his skills in a clinical exam. That has now become difficult, as direct examination of a patient in an exam is not always easy. So the role of simulation, structured and embedded subjects has come into play as a major role in a medical graduation examination.

As mentioned earlier in the section on OSCE, two essential measures of performance which are also quantifiable are employed in the process of assessment.

They are:

1. Validity is defined as the degree to which the inferences made by competence based on assessment scores are correct (Messick 1989)
2. Reliability or generalisability is a measure of the relative magnitude of variability in scores due to error, with the aim of achieving a desired level of measurement precision (Shavelson and Webb 1991)

The traditional system of preclinical examination comprised theory papers, combined with practicals and viva voce. In clinical exams it was once again the combination of theory papers in the form of essays writing and clinical exams as short and long cases. The short cases allowed the examiners to assess the instant diagnostic ability of a student through a process of quick data analysis and critical thinking. The long case, on the other hand, allowed the examiners to evaluate a student's ability to communicate with the patient through a process of interrogation, interviewing and collection of important and relevant information. It was followed by a critical evaluation of physical and clinical examination, diagnostic evaluation and problem solving through a process of elimination of possible contributors arriving at a definite diagnosis.

This exam was always supplemented with a table viva voce, spotting and identifying various instruments employed in clinical management, identification of museum specimens, etc. The process was designed to correlate various components of desirable learning experience, and to assess the level of competence required to move on to the next stage

4.7 Methods of Evaluation

Essay writing is the most original format. It has been standard practice for a century or longer. Each essay can extend from 30 min to 12 h, depending upon the number of questions asked. The primary focus of an essay rests with in-depth evaluation of one particular topic within a subject. For instance, it could be a question asking for the detailed anatomy or physiology of a particular organ in the abdomen. Or in a clinical setting, say, asking about a duodenal ulcer or breast cancer, etc. The purpose is duly served as the question demands various subjects to be covered within a given period of time. It could ask for aetiology, pathology, signs, symptoms and management of, say, a duodenal ulcer in a man of 35, etc. So the whole principle is based upon knowing what the student knows about one particular topic. Traditionally, there would be four or five questions in a 3-h writing session. Usually the option of an extra question is given. Frequently the examiner or paper setter would ask for a few short notes instead of one long essay. This is akin to what is now called a short essay question.

The advantages of the long essay write-up were manifold. It allowed the evaluation of the candidates' knowledge base through the process of memory and recall. It also allowed the examiner to judge the writing skills and the power of expression. For many students in the developing world, where English is the only academic medium of expression, it was always difficult for some to write a long essay truly reflecting their knowledge base. Many times there would be some students who could solve a conundrum in their local language but not be able to express it in English. Obviously this dilemma was unheard of in Western circles. In fact, what was worse, and continues to remain so as we write, is that the students of O and A levels in non-English countries are subjected to the same standard of English and maths, etc. as those in British schools. What is amazing to note, however, is that some students would get stars in all their subjects.

Many such students have gone on to lead major institutions in the US and other countries, despite the natural handicap of having to learn in a foreign language.

This drawback was particularly obvious in higher exams such as Fellowships and Doctorates. Obviously the long essays were more of a problem than other forms of written exams.

Another major problem was that only a small portion of the subject could be covered in those five or six questions. So one would often see repetition of the same questions over the years. It became routine practice amongst the students to base their exams on solving the guess papers developed by some professional pundits.

Finally, when it came to checking the papers, it was often noticed that the examiners had not gone through all those lengthy written answers, thus missing out some salient points. After all, who could go through thousands of pages of similar material in a few weeks! Stories were always circulating about discovering the written papers in a remote shop of a part-time examiner or some shadowy character marking those papers. How pathetic is that!

The curriculum designers must give full consideration to all kinds of prospective candidates, including those with special needs. As a matter of fact, great emphasis is currently being laid upon the educational needs of the disabled to preserve their dignity by enabling them to earn their own livelihood through respectable means. They should also be above all forms of bias of race, religion, colour or caste. Equality and affording equal opportunities to all must remain their motto.

The curriculum must also take into account the role of the major stakeholders in its implementation. These stakeholders are the health authority, the community, the physician and the student.

Of all these partners for whom a curriculum is important, the most affected are the public and the patients. Then it is the students hoping to become doctors to serve the community, then the physicians who obviously play a major role in the implementation of a curriculum, and finally the health authorities.

However, for some inexplicable reason, it is the health authority that dominates the scene. They determine the best or most suitable curriculum for a given community. They are responsible for the health care of the common citizen, and while the academicians are focused on scholarly pursuits, the politicians and their cohorts, i.e. health ministers, etc. know better of the outside world and any changes occurring elsewhere.

Even now, we hear of stories of ghost writers or professional copy writers who write a whole thesis for money. They even advertise their services on the web. Dishonesty has no limits!

The alternative to essay writing was found in the early 1970s in a new format called the Multiple Choice Question (MCQ).

MCQs became very popular due to the unpopularity of essay writing as they were supposed to cover the whole subject across its length and breath. The shallow knowledge base which was the critique on essay writing was presumed to be covered in MCQs, but this is not true. No doubt a larger component of the subject was covered in the form of several smaller questions, but the answer was confined to a few answers to each stem. They are asked as a single stem with several matching answers, asking the student either to choose the best or to choose between true and false.

The pattern is universal, but more examiners prefer to ask the respondent to select the best response to a given statement in the question. Obviously the replies are already mentioned, so it was a question of guessing the best possible response if one was not absolutely certain.

MCQs continue to prosper, for many reasons, such as economy of time, wider coverage of the subject and the application of computers in assessing, thus saving manpower and eliminating human bias, a major drawback in essay writing.

The problem with MCQs is mainly in terms of designing appropriate questions, which could be quite demanding and labour intensive. Besides, the question developers had to be trained to write such questions as to meet all requirements. It is the job of the department of medical education to maintain a regular supply of the MCQs in the bank.

Modified essays were introduced to compensate for the deficiencies in long essays. They are still in vogue and often employed in both undergraduate and postgraduate exams. MEQ comprise a statement of a clinical scenario followed by a couple of questions, which in turn will generate a few more questions. This is followed by the release of more data followed by a question, eventually ending up in a stepwise question and answer session, written in a narrative style.

MEQ have the advantage of covering a particular subject quite thoroughly, and the student does not have to suffer the ordeal of lengthy answer writing nor the evaluator suffer the trauma of reading long passages of monotonous description.

The Short Essay Question (SEQ) is another format in which 10–12 questions are asked with a response time of 10–15 min for each question. It serves the purpose of covering a fairly large component of subject in a shorter duration of time. The SEQ has the advantage of essay writing without overusing resources in terms of time and money. What is covered in 3 h through 4 or 5 questions could be broken down into 10–12 shorter questions, allowing a wider subject content to be covered.

Then there is another format of evaluation called the Short Answer Question (SAQ). The student has to reply in a couple of words to the questions, which have to be chosen from a given list of choices. So it is akin to the MCQ in terms of covering a wider core content than essays and more precise in response. It also allows the examiner to set questions covering the core and the basic knowledge without giving a cue. University of Dundee has adopted this innovative format in its medical school. Professor Harden is a globally recognised personality in the field of medical education, who has pioneered many innovative methodologies in this field. He headed the department of medical education at Dundee, and is a strong supporter of SAQs.

Extending Matching Questions (EMQs) are an innovative way of assessment. This is an alternate way of checking out the performance of students to MCQs. A clinical scenario is given with several related responses, for the student to choose the most appropriate responses without the advantage of a cue as in MCQs. For instance, a patient presenting with an acute coronary disease with the relevant clinical signs and symptoms. The response sheet would contain ECGs or cardiac enzymes for the student to match by selecting from a list of many options.

This form of evaluation is computer–based, thus saving human endeavour in the process of evaluation, although much effort may be required to prepare the questions.

4.7.1 Mini-clinical Evaluation Exercise (miniCEX)

This innovative method of evaluation for clinical sciences is becoming popular in many countries. It is precise, clinical and focussed. Any member of staff can conduct this evaluation by simply observing the doctor-patient encounter and tick box a list of items such as greeting, introduction, history taking, physical examination, explanation of the problem, etc. There could be about six such observations made over a period of 1 year. Each observation may not last more than 15 min. Each time a student should be observed and evaluated with a different set of clinical conditions.

4.7.2 Direct Observation of Procedural Skills (DOPS)

DOPS is a modification of the mCEX in which a candidate performs a given act under the watchful eyes of an observer. It could be a simple task like drawing a blood sample, or a more demanding one like laryngeal intubation. The observer notes down the act in sequence, and gives a grade as well as feedback at the end of the task. Each candidate should do six such activities during year. Each task should be different and carefully selected from a list provided by the master examiners. Further research is currently underway on this format of assessment.

4.7.3 Mini-peer Assessment Tool (mPAT)

This novel and interesting method involves a choice by the candidate of eight evaluators from his colleagues, seniors, nurses, health care providers, laboratory technicians, etc. who need to observe and reply in the form of a questionnaire about his technical and professional skills. A self assessment, highlighting personal strong and weak points is also added to the questionnaire by the candidate. The data thus collected, including the comments and critique, are shared by the trainee and the immediate supervisor, with a view to improve upon weaknesses.

The methodology to carry out assessment and evaluation is evolving and rapidly changing with each passing day. There are many questions that need to be answered; particularly vis a vis work-based assessment. The reader is referred to the net to follow up the debate on this subject, as no printed book can remain as up to date as the net!

4.7.4 Portfolio Assessment

> Portfolio assessment is a response to changes in medical education including the emphasis on professionalism, and the need to give students more responsibility for their own learning. Harden and Laidlaw, 2012, Elsevier. p 203.

Medical education must keep pace with times. So we have moved on from theory and practical exams designed to assess only knowledge and skills to more relevant matters like attitude, professionalism, communication skills, leadership qualities, self learning, and many other facts of life. This approach is called *Outcome Based Education*. Portfolio is a way of gathering all the relevant data proving that a process of learning has been followed over a given period of time. The student should collect every bit of evidence ranging from actual learning skills to nurses comments, patients comments, greetings cards, any rewards, certificates, presentations, attendance at courses, etc.

The Outcome-Based Curriculum is gaining popularity each day. Here is an example of its application in the process of evaluation. Rotthoff et al. (2012) investigated the long-term goals of an institution supposed to be suited for studying learning environments. They had not found any study which had tested this issue so far. Their aim was to develop a method and psychometric evaluation of an MS-Questionnaire (MSQ) focusing on explicit competencies. They investigated the extent to which the MSQ captures the construct of the learning environment and how well a faculty is following – in its perception – a competency orientation in a competency-based curriculum. Rotthoff et al. floated a questionnaire derived from the MS "teaching" (Medical Faculty, Heinrich-Heine University Dusseldorf) which was based on (inter-) nationally accepted goals and recommendations for a competency-based medical education. The MSQ was administered together with the Dundee Ready Education Environment Measure (DREEM) to 1,119 students and 258 teachers. Cronbach's alpha was used to analyse the internal consistency of the items. Explorative factor analyses were performed to analyse homogeneity of the items within sub-scales and factorial validity of the MSQ. Item discrimination was assessed by means of part-whole corrected discrimination indices, and convergent validity was analysed with respect to DREEM. Demographic variations of the respondents were used to analyse the inter-group variations in their responses.

The results were interesting as the students and teachers perceived the MS implementation as "moderate" and, on average, students differed significantly in their perception of the MS. They thought implementation of the MS was less successful than did faculty. Women had a more positive perception of educational climate than their male colleagues and clinical students perceived the implementation of the MS on all dimensions significantly worse than preclinical students. The psychometric properties of the MSQ were very satisfactory: item discrimination was high. Similar to DREEM, the MSQ was highly reliable among students ($\alpha = 0.92$) and teachers ($\alpha = 0.93$). In both groups, the MSQ correlated highly positively with DREEM ($r = 0.79$ and 0.80, $p < 0.001$ each). Factor analyses did not reproduce the three areas of the MS perfectly. The subscales, however, could be identified as such among both teachers and students.

This useful study concluded that the perceived implementation of faculty-specific goals can be measured in an institution to some considerable extent by means of a questionnaire developed on the basis of the institution's MS.

They believe that their MSQ provides a reliable instrument to measure the learning climate with a strong focus on competencies, which are increasingly considered crucial in medical education. The questionnaire thus offers additional information beyond the DREEM. They confided that their site-specific results imply their own faculty was not yet fully living up to its competency-based MS. In general, they thought the MSQ might prove useful for faculty development to the increasing number of faculties seeking to measure their perceived competency orientation in a competency-based curriculum.

Maintenance of a portfolio has become mandatory in the NHS. It is a supporting source of appraisal on a yearly basis. Each person should collect evidence of learning and keeping oneself up to date and load it onto the computer for an appraisal process. The immediate appraiser would discuss the details with the candidate and both parties, namely the appraiser and the appraised, would develop an action plan for the next year. Yearly appraisal is now compulsory and keeps everyone well poised to meet the challenges of the job.

In the field of assessment, many other things have changed since. Simulation is the way forward. It allows knowledge, skills and attitude to be assessed without employing or relying on the availability of real patients.

Simulation has been divided into two categories by masters. They are :

1. Standardised patient simulations
2. Computer-based simulation

As discussed elsewhere in this book, standardised patients are those persons, more commonly actors, who are trained to play the part of a patient depicting a typical condition, such as an RTA or a patient with abdominal pain, chest pain, etc. The students are assessed for their knowledge and understanding of the underlying pathology, skills to take a proper history and carry out a physical examination, elaboration upon the diagnostic investigations required to confirm the diagnosis, problem solving through a provisional diagnosis and differential diagnosis, and, finally, having a therapeutic plan to treat that particular simulated case. In the process of evaluation the student can be examined for all the elements mentioned plus an important art called Communication Skills (Barrows 1985; Tamblyn and Barrows 1999).

The examiner would score the student based upon specifically designed criteria for subjects chosen by the subject specialists such as history of smoking, history of fainting or any drugs taken which may have made him oblivious of his surroundings, etc. Each item is listed and a mark given for each step by the examiner. Such checklists for specific scoring criteria are prepared by the subject specialists for each case-based scenario. Emphasis is mainly on collection of data and their processing, which is collected as ratings of performance.

Computerised virtual devices are gaining ground quite rapidly. They are mostly used for training young graduates in delicate and intricate surgical skills such as Laparoscopic cholecystectomy or FESS.

The best illustration of simulators is seen in aero technology. Flight simulators are regularly employed in aviation technology. Likewise, space technology is extensively based upon simulation. It is relatively a new phenomenon in medicine. Robot surgery is still too early to be called a routine entity in modern medicine, though it is only a matter of time before it becomes routine, at least in some surgical specialties, such as delicate brain surgery, where the human hand cannot reach.

Computerised simulators are not yet fully researched, so assessment strategies are not yet fully developed. Besides, unlike structured patients, computerised simulators would require individualistic assessment strategies, such as a separate tool for endoscopic surgery as compared with a L13. Laparoscopic cholecystectomy!

> Simulations have been implemented in various testing programs based on the belief that fidelity is as important a feature of assessment as reliability and that the realistic challenges they pose enhance the validity of the examination and increase their acceptability to examinees and content experts. Research has shown that it is feasible to develop assessments that produce scores that meet reasonable psychometric criteria for validity and reliability. However, the use of simulations does raise a number of special issues that influence the validity and reliability.

A few essential parameters are employed by the educationists in assessment and evaluation: fidelity, reliability, validity, cost effectiveness, acceptability and defensibility. In this respect, the GMC has released noteworthy documents for medical schools to seek guidance from and apply in their institutions.

One major handicap of simulation is that the device follows the command like a most obedient servant. Therefore each time a command is sent, it reproduces the tasks, making it cumbersome and difficult for evaluators to judge the individual capability of the students. The complexity of the issue leads to creation of only those tasks which are relevant, pertinent and critical, and the experts are working towards developing a strategy which should meet the requirements of fidelity and breadth of sampling, without compromising the efficacy, reliability, and validity of the exercise.

Then there is the question of standardisation. Since the actors playing the part of a given clinical condition become accustomed to it, they tend to show a 'performance drift' over time. This challenges and somewhat compromises the validity of the test. Therefore masters in assessment strategy designing advise that the standardized patients may be rotated or trained adequately enough not to drift away.

Equivalence is another measure to be carefully observed in selecting the assessment tools. Since most tests are given to multiple people at varying times, different versions of the same test may be required. However, if their difficulty is more than the standard, then their validity may be questioned. So the tests have to be equitable with similar degrees of difficulty, but with different wording or paraphrasing, and should be weighted on a given scale to ensure uniformity. This process of equating requires specialist tools employed by professional examiners.

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5 Attitude

Once upon a time, life was comfortable for a physician. He was considered to be a man worthy of respect and honour, second only to the parson in a village. In matters of health care his was the final word. In many other social and moral issues he was often invited to the town hall to be one of the wise men of the community. He was knowledgeable, trustworthy, reliable and, above all, a person of diligence, duty and integrity. Then it all changed!

Medical ethics and medicine are inseparable. Both are part and parcel of each other. For generations an apprentice learnt the art of healing as well as mannerisms from the master.

Whether it was a Hakim, a *Ved*, an apothecary or an allopathic doctor, they all had their students, who spent years in close association with their masters. That long and endearing relationship inculcated many things into the pupil. By a natural process of osmosis, the apprentice would pick up certain traits from the pundit and, in his turn, transfer them to his own pupils. The process went on continuously.

The knowledge base was small and technical advances were few and far between. So after leaving medical school, the graduate would live happily serve the community as a family doctor. A few would become hospitalists and even fewer go into academia.

With the introduction of the NHS, a sea change took place in the UK, when the private practices of doctors were undermined and, reluctantly, all doctors had to join the National Health Service. They were then trained to be sound physicians, serving their patients as best they could.

In the 1960s the NHS was a cradle for imparting knowledge and due skills along with proprietary manners to its employees. Being a British icon, it was extremely disciplined and meticulous. The consultant was in charge of doctors and the matron of the nurses. As a team they worked quite well. There was due etiquette in dress, greeting patients, or generally smiling at each other. The consultant did a ward round with some panache, obediently followed by a team of assistants, and students. History taking, clinical examination, introducing oneself to the patient and showing the door on completion of the interview were all part of a drill which each student or trainee picked up

S. Zaidi, M. Nasir, *Teaching and Learning Methods in Medicine*,
DOI 10.1007/978-3-319-06850-3_5

from the boss. Starched white coats, polished shoes, ties and a stethoscope, etc. gave a certain look of authority to the doctor. Nurses were equally smartly dressed, with their blue dresses and white starched aprons, smart hat, watch on the left lapel of the shirt and a pair of scissors tucked into the dress pocket. All of this was part of an attitude which was considered not just adequate but essential to maintain a certain degree of distinction between the patient and the physician. In a way it was part of the colonial British culture, where civil lines separated the elite from the common citizens. However, it worked well in itself and the health care was excellent (Fleming et al. 2014).

The Second World War has left indelible marks everywhere, even though Britain won the war, but the cost of running that war, as indeed also the subsequent adventures elsewhere in the world, has cost the economy far too much to cope with the losses. The loss of colonies, which were a major source of revenue for more than a century, also expedited the decline.

So the reasons behind the decline of the NHS are easy to see. It has become a target for all forms of ridicule, criticism and pathos. In its heyday it trained thousands in the art of healing and, indeed, mannerism – for which we remain grateful.

The actual decline of the authority of a physician began nineteen when it was considered necessary by the responsible authority to bring about drastic changes in the training schemes.

The famous document of the GMC called Tomorrow's Doctor (1995) introduced radical reforms in educational planning and strategies, the sum total of which was to produce doctors for the changing world. This had much to do with the rapid expansion of knowledge and technology. It was thought by the stalwarts that knowledge was expanding so fast that no single person or mind could absorb and retain it. Computers and tablets have made the demands on memory and recall at least partially transferable to these machines.

Around that time the Calman–Hine report also appeared, which reformed the training process of graduates by streamlining and restructuring. Its results are currently visible in the NHS. Postgraduate training is constantly being revised, updated and improved.

The whole paradigm shift has resulted in the decline of the doctor's position in the eyes of the patient, thus depriving him of the authority education had granted him. The ageless paternalistic approach which had served mankind for generations lost its glory and ended up in the bin.

The physician has now been converted into a heath provider and the patient into a client. The trust and confidence which was the cornerstone of this wonderful relationship has been irreparably damaged. It has become a contractual job rather than a noble profession. The contract has to be signed each step of the way between the server and the served. So, just as with any other contract, everything must be documented, witnessed signed and sealed.

The whole philosophy of medical practice was based upon the fundamental principle of mutual trust. The patient believed in the doctor's word, his expertise and his advice. An oft repeated statement by patients in all cultures and all regions was 'do as the doctor has advised' or more affectionately as 'just what the doctor ordered', or even sometimes a blind faith statement of 'please doctor do what you think is best'. That was a feel-good factor for the physician too. That honest, blind, total trust brought the patient very close to the physician. He thus treated his patient as he would treat his own family, just as he had sworn to in the Hippocratic Oath.

The breakdown of mutual trust and the decline of faith have resulted in third party decision making; which, in turn, has led to many a questions. One of them is the principle of self defence.

When the paternalistic approach was working well, mannerism or medical ethics was confined to the basic attributes such as greeting the patient, introducing yourself, pulling up a chair for an elderly patient and so forth. What went on between patient and physician was usually an individual affair as the physician was considered to be as much part of the family as the next of kin. So the decision about intervention or surgical procedure was often a joint decision.

Medical ethics has now become a subject in its own right. Most curricula have allocated specific time to lectures on various aspects of moral philosophy and applied ethics.

Ethics is an ancient field which is deeply influenced by faith and culture. A timeless debate continues to rage between the proponents of universalism and moral relativism. As expected of wise men, nobody ever seems to give in and the heated arguments continue to rage across the globe.

The fundamental truth is that morality is neither dependant nor indeed relative to any religious faith. Moral codes are more ancient than most religious faiths anyway. Even a cave man had certain moral values which were applied by the tribal chief to keep matters under control. With the advent of civilisation and the emergence of man from the cave, those values had to change. It was essential for people to live in small communes, thus developing strategies to save and protect themselves from the enemy, be it beast or a man from a different tribe. So the moral code had to safeguard the interest of the individuals and the community. The process continued over millennia, until the formal declaration of a moral code by a Babylonian king called Hammurabi. He was a kind man and was thoughtful, benevolent and generous. He outlined certain principles, which were promulgated in 1772 BC approximately, in the ancient lands of Babul –o- Nianevah. Hammurabian code is well preserved on a clay tablet which is displayed in the Louvre in Paris.

On a recent visit to the University of Babylon, SZ had the privilege to visit a Babylonian fort and the historical Ishtar gate. The original Ishtar gate was excavated by the Germans during the first war and relocated to a museum in Berlin. Not far from the fort stood the Babylonian hanging gardens, now in ruins.

King Hammurabi founded certain moral principles which have stood the test of time. Things changed with the growth of Greek civilisation, and the role played by sophists such as Thales, Pythagorus and Protagoras, who taught ethics for a fee and were not very popular.

Then came the great philosophers, namely Socrates, Plato and Aristotle. Each had his own way of imparting education and introducing moral codes. However, the masterly works of Aristotle in the shape of his famous book called Nichmacean Ethics has stood the test of time. Most latter day philosophers and ethicists have used this book as the foundation work for building their own "structure" upon.

The evolution of ethics has been discussed in book called Ethics in Medicine (Zaidi 2014). Suffice it to say that anyone and everyone from St Thomas Aquinas to Bertrand Russell have duly praised the works of Aristotle, which seems to have benefitted mankind for several millennia.

Aristotelian works were translated by Arab and Muslim teachers in the 8th century AD, mainly in the era of Haroon-al Rasheed and his son Al-Mamoon. These translations were from Greek into Arabic. Later on they were transferred to Andalusia, where the Moors reigned. In the thirteenth century many of these works were translated into Latin and read by the medieval Christian and Jewish philosophers.

After the so-called La Conquesta in 1492, a huge loss of the treasures of ancient libraries in Grenada and other city states of Andalusia was sustained when the Christian mercenaries burnt them down, but many Jewish migrants during the diaspora transferred ancient documents to Eastern Europe. Later on some of these works became a major source in the transference of Greek though to post-renaissance Europe.

Virtue theory was presented by Aristotle. It described that some people are by nature virtuous and can do no harm nor indeed perform an evil act. It is a part and parcel of their habit and development.

This theory had vanished for a long time but has been revived by MacIntyre in the form of Neo-Virtue theory.

Two prominent ethical theories seem to influence the medical profession the most. They are:

1. Deontology
2. Utilitarianism

Deontology was put forward by Kant, a German philosopher. He believed that a person should perform an act of duty with pleasure and good intentions, resulting in good results. In other words, according to deontology, the 'means as well as the end' should both be good.

It is a very popular theory, which forms strong bonds with contemporary principles of medical ethics.

Utilitarianism or Consequentialism is a theory based upon the philosophy presented by Bentham and Stuart Mills. It basically employs the principle of happiness for a larger group. In other words, an end can justify the means. So even if the act itself may be less than good, if the outcome brings happiness, joy or relief to the beneficiaries, then the act may be justified.

This theory has been criticised by many philosophers as it was the foundation of the experimental work carried out by Nazi physicians on human beings in the concentration camps. It is also the basis upon which animal experimentation is justified, albeit to the utter disgust of the animal protectionists!

In medical terms, the following four principles of medical ethics are accepted as the gold standard. They are:

Autonomy
Beneficence

Non-maleficence
Justice

Although these principles have been in vogue for a number of years, the credit for their formal recognition goes to Beauchamp and Childress, who reintroduced the subject in a logical way through their book called 'The Fundamental Principles of Medical Ethics'.

This book has become the cornerstone in the field of medical ethics. Many other books have been written on the subject in different parts of the world since, but the Beauchamp and Childress book remains the guiding light, particularly in the West.

Autonomy basically means that an individual is entitled to possess all human rights, particularly free and independent decision making in all a matters of life, health, illness and death. Informed consent is the very backbone spine of autonomy. In fact this word is relatively new as it was first used by Judge Bray in a California court in 1957. Prior to that, people were content with the use of 'consent' in most matters.

Informed consent is a part of many other forms of consent which are generally accepted by the medical profession. However, it is the most important and legally most binding principle of medical ethics.

It means that the patient has been given a full and detailed description of his illness, including the investigative or diagnostic procedures, the pros and cons of treatment, any intervention if required, possible complications and any additional intervention required, etc.

In other words, it is essential that a physician describes, discusses, explains and notes down all the relevant matters regarding a patient's illness and the intervention planned. It is of particular importance in surgical procedures or an intervention which the patient may require.

Until recently the Bolan principle gave some protection to a physician, but now every possible complication envisaged as a result of an interventional procedure must be recorded in the patient's notes after fully explaining each item to him. It may sometimes have an adverse effect on the patient as he may decline an intervention for the fear of complications. It is therefore essential that a physician has good communication skills.

A verbal consent is often adequate enough, as in day to day clinical work. Sometimes express consent is needed, as in the case of an emergency, and now a new form of consent is emerging, called presumed consent. It basically means that a patient is presumed to have given consent for an intervention unless he opts out. It is currently being debated in the Welsh Assembly in the UK and may carry huge significance in years to come.

One particular form of consent, common in Eastern nations, is called surrogate consent. Because these cultures are family oriented, major decisions regarding health and disease are taken by the family as a unit and not just by an individual as in the West. It is of particular significance in major illnesses such as cancer, where the family wants to know the bad news before the patient per se. It is believed by many, that if bad news is broken to the patient it may affect the patient adversely, as he may succumb to his illness psychologically.

Truth is a virtue and truth telling is taught in all professions, but particularly in the medical profession. In many cultures, because of family bondage, a physician may sometimes be obliged to withhold the truth from the patient. It is not the same as telling a lie, as the principle of beneficence demands the physician act in the best interest of a patient.

Consent is of paramount importance in minors, the mentally deficient and vulnerable adults. It is easier to establish the parameters in the case of minors living with parents.

However, it is not so easy where foster parents, or social services, or indeed other family members are guardians.

For the mentally disabled and physically dependant patients there are strict guidelines for observing the code of ethical treatment in the UK.

Beneficence is a principle which is the very reason the medical profession is called a noble profession. It is expected of every physician to serve the patient with honest and fair intentions to achieve good results, i.e. treat, cure or provide relief to a patient through his knowledge and skill. Doing good is an integral part of a physician's training. It does not need to be taught but should form a natural ingredient of a physician's daily activity. After all most of us are Good Samaritans anyway!

Beneficence is based upon the principle of trust and confidentiality. It is expected of a physician to be both an excellent physician and an honest and trustworthy human being. In order to serve mankind efficiently and diligently when suffering from an illness, a physician is expected to employ the professional attitude with the sole intention of doing his best for the patient. Anything short of extreme proficiency is considered to be unethical which may lead to an unhappy result. That is why a corollary to the principle of beneficence is that one must include the element of non-maleficence. In essence it means that through beneficence one should serve with efficiency while also applying the principle of non-maleficence, i.e. avoiding harm to a patient.

Finally, the fourth and most significant component of ethical principles is justice. This attribute is considered to be the most potent of all other attributes, irrespective of faith, custom or religion.

There are many definitions of justice but the best was given by the greatest jurist of all times, namely Ali ibne Abi Talib. He defined it as orderly placement of all elements, the opposite of which is chaos leading to injustice or *Zulm*.

Justice is either distributive or retributive. It is distributive justice which plays such a significant role in medical ethics.

Distributive justice determines that services are qualitatively and equitably distributed amongst the beneficiaries. There are many parameters in the field of distributive justice which must be taken into account. In an egalitarian society, such as the present-day Britain, most people receive the benefits of health on the basis of their needs and not of their ability to afford it, as is the case in many developing and developed countries. Even the most powerful and, indeed, affluent country in the world, i.e. America, does not provide free and equal health opportunities to each and every citizen. The Obama health care plan is expected to extend cover to a large number of hitherto uninsured folk, especially those who were denied health insurance on account of a pre-existing clinical condition.

Distributive justice does not grant everybody free and equal access to everything. It takes into account such factors as the degree and amount of effort, labour, money or other resources contributed by an individual to the system. Those who have put in extra hard work or labour actually deserve to receive a share of the dividend equal to their contribution.

In matters of service, it is expected that those who have contributed to the development of a therapeutic drug or a method for the benefit of mankind by active participation in research should be given equal access to the treatment or therapy as those who pay for it or are entitled to it through their social services or National Insurance contribution.

There are many examples where the principle of distributive justice has been either abused or exploited in medical and clinical trials. One blatant example is that of the AZT trial. Once the drug was found to be beneficial in reducing the vertical transmission of HIV from mothers to babies by at least one-third , an extended trial was carried out in Africa and Thailand. Once the results were found to be affirmative, the drug was withdrawn or at least taken out of the reach of those involved in clinical trials. That was indeed a bad example.

Retributive justice implies that punishment should be compatible with the crime. If the punishment is more severe than the crime committed, it would be unethical and unlawful. There are numerous examples of tyrants in the world who, for the slightest of crimes, would order the execution of a person. It happens all the time in the tyrannical states in the Middle East and elsewhere. Authority must be matched with compassion. Forgiving is far better than punishment, albeit with caution.

Formal teaching of medical ethics began only a decade ago. However, it has now acquired a pivotal role and has become the essential third dimension of education. It seems that the triangle of education is now complete, comprised of knowledge, skill and attitude, the latter meaning ethics, morality and mannerism.

Here is a sample of a PBL module on medical ethics.
Short lecture followed by small group discussion.
What is organ donation?
What is a transplant?
What types of organs can be donated?
Why would the transplant be required?
Statistical data for organ transplants in a given country. Universal and global data.
Small group discussion: PBL.
Leaning issues, e.g. aims and objectives, quality of life, etc.
Informed consent, presumed consent, etc.
Discussion with the patient and the family, pros and cons.
Communication with the donor family.
Consultations with the recipient.
Renal transplant; liver transplant, etc.
The procedure: its pros and cons.
Technical details … a lecture by the kidney/hepatobiliary/heart surgeon, immunological aspects of the transplantation. A lecture by the immunologist.
Graft repetition and therapeutics.
Experiences of the recipient from the relative.
Experiences of the cadaver organ recipient.

Issues related to the termination of life, brain death, religious and moral implications of organ harvesting.

Dilemmas, e.g. organ trading, smuggled or harvested illegally.

Should commercialisation be legalised. After all, blood is bought and sold every day in many developing countries, and ova and sperm banks are all commercially available in many European countries.

Outcome measures on organ donation awareness, organ theft, transplantation methods, rejection, and its prevention, organs for sale, financial and fringe benefit issues, organ harvesting from condemned prisoners of conscience. Human rights issues.

Culture sensitivity is an essential component of clinical care. Here is an example which displays its importance in today's multicultural, pluralistic world.

An Asian man was biopsied for a possible pulmonary carcinoma. He was then invited to attend the MDT where he was due to receive the bad news. His son walked in to see the doctor's team pleading for the bad news to be broken to him rather than the elderly patient, his father. He feared for the worst if the old man was told the truth, as he had frail health and might succumb.

Now the question that arises here is that of the principle of mutual trust and faith between patient and physician, which would be compromised if the patient was not directly involved in news breaking. His autonomy may thus be compromised. Surrogate consent is the norm in Eastern culture but not in the West.

The plea supporting the request of the patient's son can be given through the observation of the code of beneficence and non-maleficence above the principle of autonomy. Furthermore, if the MDT doctors did not tell the truth to the patient, would they be breaking the code of truth telling. Is withholding truth the same as telling a lie?

Unless medical ethics is taught at undergraduate level, the future physician is bound to find it difficult to match the demands of times. Many ethically challenging questions are bound to crop up in his life, to which he may have no answer. The basic job of teaching undergraduates in medical schools and colleges is that of laying a firm and solid foundation to be built upon. A weak foundation may not enable the final a structure to be strong and solid enough to withstand the onslaught of future problems.

It is about time that medical educationists started to give due recognition to the formal teaching of medical ethics. Whether it is in the form of conventional lectures or small group discussions is a matter of choice for the revenant authorities. Medical ethics is a fascinating subject which can be taught through PBL and/or didactic lectures and discourses. Problem-based learning (PBL) was the modus operandi of the Greek great Socrates, when he posed problems and never gave an answer. When asked by the cynic, he'd simply say that giving an answer will discourage you from finding your own way through the maze. Learn to solve the problem through active engagement. Is that not the fundamental rule of PBL? Be actively involved, learn for yourself and be a lifelong learner.

What better way to impart education on medical ethics than following in the footsteps of that great Greek philosopher.

Once armed with core knowledge of medical ethics, the physician must then continue to expand his knowledge through daily encounters. That is indeed the current concept of medical education in brief, i.e. ‘core knowledge at undergraduate level and continuous, to more knowledge learning throughout life’.

The following study discusses the role of medical ethics in medical education.

Doukas et al. (2012) rightly believe that medical education accreditation organisations require teaching of medical ethics and humanities as a part of the curriculum to develop professionalism in medical students. The authors lamented that there has never been a comprehensive critical appraisal of medical education in ethics and humanities. They labelled this project as a ‘Project to Rebalance and Integrate Medical Education (PRIME) I’. A workshop was convened in May 2010, which undertook the first critical appraisal of the definitions, goals and objectives of medical ethics and humanities teaching. It was a welcome study, as no similar studies have been found in the context of medical ethics as a part of curriculum.

It described assembling a panel of national educators representing various disciplines including ethics, history, literature and the visual arts. This panel was given specific terms of reference to describe the major pedagogical goals of art, ethics, history and literature in medical education. They were also asked to advise as to how these disciplines should be integrated with each other in medical education.

This study looked at the following three parameters; the authors call them ‘themes’:

1. To promote humanistic skills and professional conduct in physicians
2. Patient-centered skills enable learners to become medical professionals, whereas critical thinking skills assist learners to appraise critically the concept and implementation of medical professionalism
3. Implementation of a comprehensive medical ethics and humanities curriculum in medical school and residency requires clear direction and academic support based on clear goals and objectives which can be reliably assessed

The study was extremely comprehensive and highly profitable for emphasising the role of medical ethics, concluding that the teaching of medical ethics is essential for professional development for physicians.

One can’t agree more with this observation. Medical ethics and humanities do indeed humanise medicine.

Teaching of medical ethics is essential not only for medical students but also for residents, who would, in the future, take over professional practice in life. A study was conducted by Pauls (2012) in Canada to document the scope of the teaching and evaluation of ethics and professionalism in the family medicine postgraduate training programs, and to identify barriers to the teaching and evaluation of ethics and professionalism. The study was conducted in the form of a survey which was developed in collaboration with the Committee on Ethics of the College of Family Physicians of Canada. All 17 Canadian postgraduate family medicine training programs were invited to participate from June and December of 2008. Various attributes were evaluated, such as the structure, resources, methods, scheduled hours and barriers to teaching ethics and professionalism. The survey also focused on end-of-rotation evaluations, other evaluation strategies and barriers related to the evaluation of ethics and professionalism.

The response was 80 %. Most respondents (87 %) had learning objectives specifically for ethics and professionalism, and 87 % had family doctors with training or interest in the area leading their efforts. Two-thirds of responding programs had less than 10 h of scheduled instruction per year, and the most common barriers to effective teaching were the need for faculty development, competing learning needs and lack of resident interest. The overall results showed that most programs had learning objectives and designated faculty leads in ethics and professionalism, yet there was little curricular time dedicated to these areas and a perceived lack of resident interest and faculty expertise.

The most encouraging observation noted was that many programs evaluated ethics and professionalism as part of their end-of-rotation evaluations, but the discouraging news was that only a small number used novel means of evaluation, and identified the lack of suitable assessment tools which proved to be an important barrier.

Medical ethics is regaining its lost glory as it is being reintroduced in the medical curricula. Roberts and colleagues (2005) show us that training in ethics has become a core component of medical student and resident education. Curricula have been developed without the benefit of data regarding the views of physicians-in-training on the need for ethics instruction which focuses on practical issues and professional development topics. In their research a written survey was sent to all medical students and PGY1-3 residents at the University of New Mexico School of Medicine. The survey consisted of 8 demographic questions and 124 content questions in 10 domains. Responses to a set of 24 items related to ethically important dilemmas, which may occur in the training period and subsequent professional practice, are reported. Items were each rated on a nine-point scale addressing the level of educational attention needed compared to the amount currently provided.

The survey respondents included 200 medical students (65 % response) and 136 residents (58 % response). Trainees, regardless of level of training or clinical discipline, perceived a need for more academic attention directed at practical ethical and professional dilemmas present during training and the practice of medicine. Women expressed a greater desire for more education directed at both training-based and practice-based ethical dilemmas when compared to men. A simple progression of interest in ethics topics related to level of medical training was not found. Residents in diverse clinical specialties differed in perceived ethics educational needs. Psychiatry residents reported a need for enhanced education directed toward training-stage ethics problems. Their study documented the importance placed on ethics education directed at practical real-world dilemmas and ethically important professional developmental issues by physicians-in-training.

The recommendation by these authors must be applauded for their advice as they also believe just like us that academic medicine may be better able to fulfil its responsibilities in teaching ethics and professionalism and in serving its trainees by paying greater attention to undergraduate and graduate medical curricula.

The question papers in the USMLE (United States Medical License Exam) cover all three aspects of medical education, namely the knowledge, the skills or problem solving methods, and the medical ethics in the form of problems or dilemmas related to moral and ethical issues. At least one-third of the questions cover various aspects of human attitude, from simple items such as mannerisms to progressively complex issues such as surrogacy or third party gamete transfer, etc.

It is definitely heartening to note that modern medical educationists have granted due place to medical ethics. Each day brings new dilemmas and each day a controversy crops up in a physician's life. One may not have an answer to all the problems, but armed with the knowledge of fundamental principles, one expects a physician to mange his patients ethically. That is the whole objective of incorporating medical ethics as a subject into a curriculum.

Technological advances in the present day are opening a proverbial Pandora's box, and posing huge dilemmas for the contemporary physician. One such dilemma is the employment of modern methods of third party gamete transfer in sterile people wanting to have a baby. It is a rapidly rising situation, not just because more and more females are getting married or wanting to produce children later in life, as they give a priority to their careers over motherhood, but also because of gay folk wanting to have a biological child.

Surrogacy is an ancient Babylonian custom which fell into disuse or disrepute over time. Shared parenthood is still in vogue in many African tribes. In the West, however, surrogacy has just caught on. It is nowadays being discussed at various platforms.

The principles and philosophy of education are rapidly changing. With the advent of open universities, more and more people are going online to do their courses, obtain a recognized qualification, get a decent job and move on in life.

Fresh projects are being launched to establish the traditional universities across the globe. China is spearheading in this field as in many others at the present time. America, continuing to maintain its top slot in education, is encouraging private entrepreneurs and NGOs to volunteer their own universities after going through a prescribed process.

The prospectus and admission policy of a medical school have to meet the local needs of the community. In certain countries a medical school is part of the faculty of health sciences, in others it may be an independent body. In any event it is the licensing authority determining the duration of the course or the subjects to be taught. The university is primarily a degree awarding body, with control on the instructional strategies, the nitty gritty of the syllabus and assessment or evaluation.

The world is facing an acute shortage of physicians. As the population ages, more and more people need health care. The killer diseases of the pre-war era have generally disappeared in most parts of the world, except for parts of Africa and the Indian subcontinent. Despite this, the average age has increased to some extent.

In the developed countries the economies are struggling to cope with the rising cost of health and nursing care for the elderly. In fact, in some European countries there is growing concern that in the not too distant future there will be more pensioners than working people, the cost of disease seeming to be shifting more towards age-related disabilities.

Many countries have increased their manpower in terms of health personnel, by producing more doctors and nurses, but the disparity between resources and persons needing the services continues to grow. Besides, the cost of medical education and training of personnel is rising each day. Many European countries and North America rely heavily upon overseas doctors and nurses to fill the slots. This has been the situation for nearly half a century and continues to remain so. Many innovative ways of teaching have been introduced by the educationists over the years, but so far the concept of the open university has not caught on in the medical profession. But who knows?

The famous three theories of medical ethics are:

Deontology
Utilitarianism
Virtue theory

Deontology, introduced by Kant, basically means performing a duty with the purpose that both the means and the end are to be good.

Utilitarianism, introduced by Bentham and Mills, basically advocates happiness for larger masses, where the end can justify the means.

Virtue theory, which is the most ancient of all, implies that virtuous people can only act virtuously.

It was initially presented by Aristotle, now revived by MacIntyre.

Virtue ethics is popular once again. The following study is mentioned as a fine illustration of applied ethics.

Faunce (2004) describes the role of whistle blowing in health care. Faunce says that, despite the benefits it has brought to healthcare systems in many developed countries, it is still considered to be a pariah activity by many of the most influential healthcare professionals and regulatory institutions. Few if any medical schools or law department health law and bioethics classes teach whistle blowing in a formal sense. Yet without exception, public inquiries initiated by healthcare whistle blowers have validated their central allegations and have demonstrated that the whistle blowers themselves were sincere in their desire to implement the fundamental virtues and principles of medical ethics, bioethics and public health law. In many jurisdictions, the law, this time remarkably in advance of professional opinion, has offered legislative protection for reasonable allegations from whistleblowers made in good faith and in the public interest concerning a substantial and imminent threat to public safety. One reason for this paradoxical position, explored here, is that healthcare whistle blowing lacks a firm virtue-based theoretical bioethical and jurisprudential foundation. The hypothesis discussed was whether the lack of this bioethical and jurisprudential substrate has contributed to a situation where healthcare whistle blowing suffers in terms of institutional support because of its lack of academic legitimacy. His work commences the process of redressing this imbalance by attempting to lay the theoretical foundations for healthcare whistle blowing.

The author informs the readers about the Personal and Professional Development course at the ANU Medical School where healthcare whistle blowing is a formal part of a virtue-based curriculum which emphasises the fundamental importance of conscience.

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6 Additional Teaching Subjects

6.1 Evidence-Based Medicine

Evidence-Based Medicine (EBM) is the contemporary and most important innovation in modern medicine. It has changed the whole philosophy of medical care. It is scientific, innovative, extremely practical and most challenging, in fact the most radical transformation in patient care.

David Sackett (1997) says that evidence-based medicine is time honoured and its origins extend back to mid-nineteenth century Europe. It is based upon the philosophy of employing the latest contemporary evidence to treat a patient as judiciously, as honestly and as meticulously as humanly possible. It revolves around the pivot of the personal clinical experience of a physician duly supported by externally documented, published and systematically researched evidence on the relevant problem.

The personal clinical experience of an individual duly comprises efficient and proficient decision making over a number of years. Such experience is not gained without blood, sweat and tears. Besides, such clinicians are considerate, polite, soft spoken and full of moral values. In other words, they practice medicine which is holistic and humane. They believe in rights and obligations, professional commitment, and above all respect an individual and his decision making. They are compassionate, humane and conscientious.

A desirable attribute of such a clinician is that he harnesses external support based upon relevant clinical research, founded upon clinical reasoning and experience as preventive, diagnostic, therapeutic curative, rehabilitative and prognostic factors.

One major role of 'external factors' or external clinical evidence is to negate previously established diagnostic and therapeutic plans. The old order is duly replaced with the latest, clinically proven, efficient, accurate, precise and specific strategies, with the only aim being to solve the patient's problems.

External clinical evidence both invalidates previously accepted diagnostic tests and treatment and replaces them with new ones that are more powerful and more accurate.

S. Zaidi, M. Nasir, *Teaching and Learning Methods in Medicine*,
DOI 10.1007/978-3-319-06850-3_6

It is an established fact that the richer a personality is in knowledge and skills, the softer and more malleable is his personality. A clinician endowed with these attributes is selfless and humble. He would have full faith in his clinical experience but also benefit from external evidence, as neither alone is enough. No single person can boast about his expertise as it may bring much harm to the patient. External evidence duly supports an individual's expertise and is always based upon the latest research.

The aims and objectives of EBM are best described by its pioneer, David Sackett (1997).

> The practice of evidence-based medicine is a process of life-long, self-directed learning in which caring for our own patients creates the need for clinically important information about diagnosis, prognosis, therapy, and other clinical and health care issues, and in which we: (1) convert these information needs into answerable questions; (2) track down, with maximum efficiency, the best evidence with which to answer them (whether from clinical examination, the diagnostic laboratory, from research evidence, or other sources); (3) critically appraise that evidence for its validity (closeness to the truth) and usefulness (clinical applicability); (4) integrate this appraisal with our clinical expertise and apply it in practice; and (5) evaluate our performance.

EBM is indeed an innovative way of solving many clinical problems. It is not based upon theories and hearsay but on a systematic collection of scientific data, synthesising and analysing it, with the purpose of arriving at clinically proven, research-based findings to give the best possible health care to the community. In other words, EBM places little value on traditional, unsystematic, sometimes irrational experience based upon clinical experienced founded on a patho-physiological basis.

The very soul of EBM is that it gives unprecedented importance to '*evidence*' based upon clinical research as applied to solve a clinical or health problem for a patient. The evidence has to be gathered through practical, scientific and clinical data, duly assessed on sound principles of research.

EBM is not really as modern as it is presumed to be. As early as the 1940s, people were already thinking of gathering scientific data to develop outlines for patient care, but it was in 1972 that Professor Archie Cochrane of the University of Cardiff presented the real and organised doctrine upon which the future EBM was due to be based. The acceptance was slow and it took another two decades, in fact longer, before it was taken seriously. In 1992, two scientist-clinicians, namely, Gordon Guyatt and David Sackett of McMaster University, finally developed and duly presented the methodology per se (BEME).

The conventional practice of medical care was based upon harnessing information from textbooks and whatever was taught in the medical schools. However, EBM has brought about a revolution by introducing the principle of treating a patient based upon the evidence of proven benefit to the patient, avoiding treatment without proven efficacy, thereby avoiding harm.

It is interesting to note that the philosophy of EBM is based upon an age old basic principle of medical science, namely personal experience. Textbooks are full of information, but nothing can beat the value of personal experience in matters of clinical judgement. For instance, idiosyncrasy or an adverse drug reaction encountered by a clinician will carry more weight than a written statement or an observation recorded in a book. Personal nutrition and clinical reasoning also carry a lot of weight in major decisions. EBM gives due importance to these factors. Compounded with the published evidence and sharing such information with peers and colleagues, EBM becomes an innovative and practical way of problem solving. For these reasons, EBM is based upon the latest research and documentation facts and figures.

Research is the backbone of medicine. Without active research, no progress can be made. Original research is an expensive item. It requires a special mind to conduct research. The researcher is usually totally dedicated, determined and of course an extremely bright person. Research is an important subject which is discussed elsewhere, but suffice it to say that research is a fundamental element in EBM. Documentation and publication of research and clinical evidence lays the foundation of EBM. Research ethics is a subject in its own right.

Universal guidelines are available not just for research but also for documentation, morally and ethically.

EBM is a very scientific and systematic way of documenting evidence to be duly employed as a highly authenticated piece of information. It is gathered through a long process of collection of scientific data, its synthesis, analysis, meta-analysis and finally saving in the archives for use as and when needed. EBM follows two fundamental rules, namely:

Hierarchy of evidence, for clinical guidance
Assessment and evaluation of costs, benefits, risks and alternate treatments

Clinical guidance is only possible if one has gathered enough clinical experience based upon practical problem solving strategies. It takes years of hard work, dedication and deep insight into day to day as well as long-term clinical cases that one deals with in one's life. Gathering information, saving it for later use and sifting it, with the clear objective of discarding the useless or less than optimum data from the genuine, effective, and valuable information, is an art.

Experienced clinicians have the knack of doing just that almost imperceptibly. Others have to acquire the trait through grit, patience and determination. If you want to succeed in a professional career, you must develop the art of collecting useful data not just for personal reflection but also to share with peers and followers.

The evidence should be solid and proven through documentation and analysis. Hierarchy of evidence is a building block of EBM.

It is the moral obligation of a clinician to provide all the necessary information to his patient. It is incumbent upon him to advise the patient, prioritizing the benefits to the patient above all other considerations. To decide in favour or against a diagnostic test or a particular treatment, the physician must use unbiased data, keeping the principles of good medical practice in view at all times. The patient should also be fully informed of the risks involved in a given treatment and, indeed, all foreseeable complications which a certain procedure may cause.

In countries where health is either the state's responsibility or that of private health insurance, the approach may be slightly different. In those nations where a patient has to buy each item of health care, the subject of costs vs benefits gains huge importance. To give advice which is unaffordable would be neither practical nor indeed justified. An expensive investigation or treatment in a private health service may cost the family a fortune. They might comply with your advice, but perhaps at the cost of sacrificing some valuable elements in their life. It is not unknown, particularly in developing nations, to see malpractice of various sorts, where a greedy physician may advise a battery of tests from his personal or his colleague's laboratory, a scan or two, and then an unwanted series of follow-up investigations. Eventually the bill might become so inflated that the patient may to have abandon it all due to lack of further resources.

It is also essential that a physician discusses other options available to a patient. To be biased against a particular type of treatment or therapy is unethical and unjustified. The job of a physician is to enlighten the patient on the alternative therapies available. A fully informed decision by a patient should then be duly respected.

In many countries, where the standard of education is poor and the patients rely heavily on the doctors' opinion, this responsibility becomes hugely important. An honest, ethical and moral physician would explain to the patient the pros and cons of a treatment based upon proven and documented evidence rather than simple hearsay, or indeed a personal opinion, without any scientific support or evidence.

It is not only the element of cost vs benefit but also the logistic difficulties, the burden of the disease on the person or the family and the eventual outcome of a given treatment which should influence the final decision. It is of no use to the patient if the treatment offered is impractical or not feasible. For instance, in a case of chronic renal failure, advice to undertake dialysis may not be compatible with the patient's personal circumstances. He may simply have no support or facility available to bring him to a dialysis unit a few times a week. In advanced countries such a situation may not arise, though it can, on account of the nature of the individualistic culture in the West.

One might simply say that EBM bases its application on a firm foundation of knowledge and skills, so vital for a physician to possess, duly compounded with humanism, i.e. medical ethics. So it is the good old triangle of medical education, namely knowledge, skill and attitude, which aptly and quite appropriately applies to the practice of EBM.

Humanizing medicine is the slogan of most contemporary educationists. Medical ethics was always part and parcel of medicine, but fell out of practice as the profession progressed. We must give thanks to the post-war tribunals which unearthed the atrocities of the Nazis conducting research on human subjects without their consent and quite unethically. EBM gives due importance to the principles of human dignity, beneficence and justice. These principles have been discussed in the chapter on medical ethics in this book.

This is the age of information. Information is knowledge. Knowledge is the basis of medical science. EBM requires a clinician to have a firm knowledge base, relying upon contemporary information as well as sound sources. The latest appropriate investigative methods and technology should complement the knowledge base. Knowledge of the latest diagnostic methodology is not enough unless it is applied in reaching a diagnosis.

Effective clinical skills and knowledge go hand in hand with each other, enabling a physician to employ clinical reasoning to reach a diagnosis and effectively treat the patient. EBM also encourages the development of clinical appraisal skills, search skills and communication skills to explain ably and clearly the risks and benefits and the alternative methods of treatment to each patient, ethically and with empathy. EBM also expects a physician to be able to manage a patient, keeping the values, norms, and practices of the patient in his cultural context. Respect of relative values in treating a patient, without compromising the ethical principles, is essential in maintaining quality care as expected in EBM.

Medicine is expanding by the day. By the time this book is published, most of it will already be part of the archives. Research is an everyday activity in the academic centres, and each day new information is added to the world's literature. It is a fundamental principle of EBM that the physician keeps himself fully informed of the latest research in his field, duly documented with high impact scientific publications. Thorough research and published data should form the basis of clinical decision making by the modern physician.

Access to the latest research and data has never been easier. The availability of contemporary literature and the speed of availability on modern electronic gadgets such as tablets and other hand-held equipment only add to the responsibility of a clinician to keep himself well read and up to date in order to manage the patient, armed with the latest knowledge and skills.

Four sources of gathering knowledge and technology are duly employed by EBM. They are:

Systems
Synopses
Summaries
Scientific studies

Systems
Textbooks, short books, monographs, etc. are included in the systems that form the basis of disseminating knowledge, clinical information, diagnostics and treatment. As mentioned earlier, such documents are invaluable, and require much reading, research and writing on the part of authors. They become somewhat less than contemporary, however, by the time they hit the library shelves, but nothing can replace text books.

Synopses
Comprised of scientific studies and systemic reviews, critiques and analyses, designed to guide the reader, usually a clinician, to serve the patients more efficiently, effectively and humanely, observing the principles of GMP and EBM.

Summaries
They are comprised of systematic review of scientific data, review articles, guidelines and clinically proven advice with a view to assessing them. However, the whole exercise and endeavour becomes meaningless if it is not targeted towards the single purpose of serving the patient subjectively, effectively and scientifically.

Scientific studies

These are extremely useful, highly creditable and the most widely employed way of gaining knowledge with a view to treating the patients, observing the code of EBM. Innumerable studies are available to all through many sources, such as PubMed. Such resources are of immense value as they are based upon considerable research, and publications on a particular topic or topics.

Some invaluable sources of information for EBM are discussed below.

6.1.1 Cochran Database

This is perhaps the most influential source of information with relevance to EBM. It holds huge scientific data identified by the Cochran researchers through published articles, systemic reviews, analyses and meta-analysis, thus supplying a researcher or a clinician with the most authentic evidence for practical guidance. It is also a great source of data for reviews of abstracts, thus making reliable scientific data easily accessible to anyone interested in research and in applying the knowledge to the service of patients on the basis of the latest, authentic and evidence-based data.

Cochran also serves as the central data for controlled trials. Such trials are absolutely vital for developing the database for clinical trials as well as research. Currently, Cochran is the best source for accessing the requisite latest data as and when required. It is also the most important source of maintaining the data for health technology. Since technology is developing faster than ever, the Cochran database is the only reliable source of knowing the value of a given technology.

One of the most useful purposes of Cochran is to function as a database for the economic evaluation of the NHS. This particular role has acquired further significance in the prevailing economic hardships faced by the British government. It is not just in the health sector but also in housing, social benefits, national economic growth, indeed nearly all elements of life, that the economic constraints are being encountered by citizens in the UK. Unfortunately, it is an economic crisis which has spread from the USA to Europe, and indeed most parts of the world. China and a few other countries are still safe and meeting the challenge, though latest reports even from China are quite worrying. British hospitals are struggling to cope with the economic constraints. Many services in the health sector are either shrinking or being remodelled. Services struggling with restricted and limited economic resources are a major ethical issue. Cochran is a great source as an economic evaluation database. It is authentic, reliable and evidence-based. Most health economists, health planners and academicians use it to its full potential.

6.1.2 Practical Example of EBM

EBM bases its application on practical demonstration as well as evidence accumulated over several years in the clinical conditions. For instance, as a common analgesic and anti-pyretic agent, paracetamol, and before that aspirin, have been the frontline remedies with both children and adults. Word of mouth has encouraged the use of these common and reliable medicines for at least two generations. EBM determines the efficacy of a drug or a combination of drugs as proved by multiple studies with strong specificity and sensitivity. For instance, a primary followed by a secondary study may prove that the conventional belief that drug A may not be as effective as a combination of drug A with drug B, or indeed with drug C in some variables, and equal or better when drug A is used in combination with drug B, and so on.

Vertigo is a common problem. Many drugs are available for its treatment. Some clinicians however, prefer to use a combination of a labyrinthine sedative such as prochlorperazine either in combination with a prophylactic drug such as betahistine, or with vestibular rehabilitation. Some even like to combine Betahistine with vestibular rehab exercises. Many studies are available supporting or rejecting one or other combination. EBM will look at all those studies, both primary and secondary, and arrive at conclusive evidence through meta-analysis and recommend one or other regimen for the management of a peripheral vestibular vertigo and not for, say, benign paroxysmal positional vertigo, where only the Epley's manoeuvre may be sufficient.

EBM is here to stay. It has radically changed the treatment strategies and the principles of health care. It is scientific and solid state, and will be a gold standard for many long years to come.

Not just that. In the last 15 years it has deeply influenced the whole philosophy of health care, health economics, health planning and implementation of health services based upon evidence collected from numerous sources and filtered out. EBM provides a coherent, tangible and practical approach in nearly all fields of health care (Sadeghi et al. 2011).

There are numerous applications of EBM. In the field of diagnostic, medical and surgical treatment and developing a future outlook to plan out further strategies, once again based upon proven strategies supported by scientifically confirmed data and authentic studies.

It is said that, despite its proven efficacy, EBM still remains an enigma and a sort of uncharted territory for many physician and surgeons. In medical schools it is just beginning to gain a foothold in terms of teaching per se. Most patients do not even know of its existence, let alone its usefulness in obtaining the best possible care based upon proven evidence.

Here is a study (Kotur 2012) duly reflecting upon the necessity of EBM in an undergraduate curriculum.

This review was designed to look at various aspects, and noted that the present undergraduate medical curricula in most institutions around the globe do not nurture the skills needed for self-directed lifelong learning in medical graduates, and it needs to be reformed in such a way that the medical graduate who is trained through this reformed curriculum possesses all the competencies of a self-directed learner. In fact, no modern medical educationist can argue with that observation. Indeed, the fundamental reforms brought about by modern education are in this very principle, namely lifelong active learning.

The authors rightly suggested that EBM is a new vision of physician learning, based on continuous development and assessment of competencies needed for creating self-directed learners. They advocated for inclusion of the EBM in the undergraduate medical curriculum.

They recommend that the clinical teaching in all forms of settings needs to be utilised to teach EBM in a holistic fashion. They believe that the introduction of EBM in the undergraduate medical curriculum, in the form of a short course, using various modes of instruction, enhances the competence of critical thinking and influences change in attitude towards EBM positively in medical students.

EBM is a reality and is becoming an integral part of medical practice each passing day. There are many institutions in the developing countries still unaware of, or at least not practicing, it. It is expected that as the knowledge of medical sciences becomes widespread through electronic media, EBM will become a norm.

Another example of EBM in research is by Ali et al who have documented a number of researches to present evidence about the effect of sleeping pattern in students of medicine and CME (Ali et al. 2013).

Paskins and Peile (2010) published a study of application of EBM in the undergrad curriculum. It is called Evidence-Based Medical Education as against Evidence-Based Medicine discussed previously in this book.

They thought that simulation is being increasingly used in medical education. So their study involved detailed exploration of the features of simulation-based teaching which undergraduate medical students value using Best Evidence Medical Education (BEME).

They observed that the systematic review features that lead to effective learning as a framework required further investigation and study.

In their useful study they performed a thematic analysis of four semi-structured focus groups with final-year medical students who had been taught acute care skills using a medium-fidelity whole-body simulator manikin (SimMan).

They mention that 12 key themes were identified, namely, feedback, integration into curriculum, learning style, learning environment, realism, teamwork, communication skills, confidence/increased self-efficacy, anxiety, performance, perceptions of foundation year 1 (FY1) and SimMan as a resource. Each theme was described with supporting quotes.

It was concluded that six of the ten features listed in the BEME review appeared to be of particular value to the medical students. This study provided a richer understanding of these features, as well as new insights into the effect of simulation on confidence, anxiety and self-efficacy which may be affected by the 'performance' nature of simulation role-play. Students also contributed critical thought about the use of SimMan as a resource and provided novel ideas for reducing 'downtime'.

No doubt this and similar studies help the medical schools to develop their own strategies for employing evidence-based in their curricula.

Many medical schools teach the principles of EBM as a subject within their medical curriculum (Ilic and Forbes 2010) Few studies have explored the barriers and enablers that students experience when studying medicine and attempting to integrate EBM in their clinical experience. The aim of their study was to identify the undergraduate medical student perceptions of EBM, including their current use of its principles as students and perceived future use as clinicians.

The study involved the 3rd-year medical students who were recruited via email to participate in focus group discussions. Four focus groups were conducted separately across four hospital sites. All focus groups were conducted by the same facilitator. All discussions were transcribed verbatim, and analysed independently by the two authors according to the principles of thematic analysis.

Focus group discussions were conducted with 23, 3rd-year medical students, representing 3 metropolitan and 1 rural hospital sites. Five key themes emerged from the analysis of the transcripts: (1) rationale and observed use of EBM in practice, (2) current use of EBM as students, (3) perceived use of EBM as future clinicians, (4) barriers to practicing EBM, and (5) enablers to facilitate the integration of EBM into clinical practice. Key facilitators for promoting EBM to students include competency in EBM, mentorship and application to clinical disciplines. Barriers to EBM implementation include lack of visible application by senior clinicians and constraints by poor resourcing.

After invaluable research through this study, Ilic and Forbes concluded that the principles and application of EBM was perceived by medical students to be important in both their current clinical training and perceived future work as clinicians. In their view, future research is needed to identify how medical students incorporate EBM concepts into their clinical practice as they gain greater clinical exposure and competence.

Smooth transfer of medical students from medical school into a residency program is the aim of all medical schools and universities. In the study conducted by Feldstein et al. (2010) it was noted that EBM has been widely integrated into residency curricula, although results of randomised controlled trials and long-term outcomes of EBM educational interventions are lacking. We sought to determine whether an EBM workshop improved internal medicine residents' EBM knowledge and skills and use of secondary evidence resources.

They described a randomised controlled trial, which included 48 internal medicine residents at an academic medical centre. Twenty-three residents were randomised to attend a 4-h interactive workshop in their PGY-2 year. All residents completed a 25-item EBM knowledge and skills test and a self-reported survey of literature searching and resource usage in their PGY-1, PGY-2 and PGY-3 years.

The study did not demonstrate any difference in mean EBM test scores between the workshop and control groups at PGY-2 or PGY-3. However, mean EBM test scores significantly increased over time for both groups in PGY-2 and PGY-3. Literature searches and resource usage also increased significantly in both groups after the PGY-1 year.

Feldstein and colleagues (2010) were unable to detect a difference in EBM knowledge between residents who did and did not participate in our workshop. Significant improvement over time in EBM scores, however, suggested EBM skills were learned during residency. They considered, quite rightly too, that further rigorous studies should determine the best methods for improving residents' EBM skills as well as their ability to apply evidence during clinical practice.

It appears that similar studies in many other centres will finally identify the parameters suitable for application either locally or universally after a consensus is reached amongst the various institutions involved.

The three well-known pillars of medical education are knowledge, skills and attitude. They have been individually discussed in this book in previous chapters.

With the growing popularity of EBM, many scholars are looking at its application in the profession. Sadeghi and colleagues (2011) looked at this aspect. They agreed that EBM has been accepted as a new and reliable paradigm in medical sciences and is considered to improve the quality of medical practice. The objective of their study was to assess the knowledge and attitudes of Kerman Medical University (KMU) residents about EBM and the rate of its application. This cross sectional study was conducted in November 2009. A valid and reliable questionnaire was completed by residents at KUM.

Ninety-four residents participated in the study in which 55.3 % were male, the mean age was 32.7 years and the mean time from graduation as a general physician was 5.6 years, 83.3 % of respondents thought that EBM was beneficial in patient care but only 5.3 % of them claimed they use EBM in more than half their clinical work and 88.3 % of the participants expressed an interest in learning EBM. The information source for clinical decision-making in 59.6 % of the residents was the text book, 41.4 % clinical judgment combined with text books and only 19.2 % articles.

As a general perception, these authors also noted that the residents of KMU had limited knowledge about EBM and it is necessary to schedule EBM education programs to increase the resident's knowledge and application.

The developing nations are still far behind in many aspects of medical education. Iran in particular has remained isolated due to the well-known political and economic embargo this nation has faced for many long years. It is sad because, in the 1980s, Shiraz was the WHO regional centre for medical education. It served hundreds of educationists in the Eastern Mediterranean region for decades.

It is encouraging to note that the spirit to keep moving ahead and remain up to date in all fields of science, and in particular medical sciences, remains alive. This study compliments many similar studies in the region and invites other institutions in the EMRO region to follow or develop their own plans.

Sadeghi et al. (2011) published another useful study where they claim that EBM in clinical practice is an important strategy for improving and updating medical services. They tried to evaluate the familiarity of clinical residents who are one of the main clinical decision-makers in public hospitals and also the next generation of specialists with EBM and EBM databases.

This was a cross-sectional study in 2010 in which clinical residents of Kerman Medical University (KMU) participated. Residents were asked about the four main EBM databases. The data were collected by a self-administered questionnaire. The data showed that, of the respondents only 26.6 % knew about EBM and only 28.7 % of the respondents were familiar with UpToDate, 22.3 % were familiar with Ovid EBM Reviews, 6.4 % were familiar with Cochrane and 5.3 % were familiar with BMJ Clinical Evidence. The frequencies of those who actually used the databases for clinical decision making and could answer the search questions were even less. The results showed most of the residents lacked sufficient knowledge about EBM and its databases. The reason is probably the non-existence of a systematic and comprehensive curriculum for EBM education during their residency program or undergraduate program. They believe that, because of the importance of learning

EBM in this group, there is a need to plan a comprehensive and proper education schedule for EBM and EBM database use at the beginning or at further stages of residency.

Here is a study from another Arab country currently suffering from insurgency, war and political mayhem. Alahdab et al. in Syria (2012) gave singular importance to the role of teaching EBM, which they believe should be evaluated and guided by evidence of its own effectiveness. However, no data were available on adoption of EBM by Syrian undergraduate, postgraduate, or practicing physicians. In fact, the teaching of EBM in Syria is not yet part of undergraduate medical curricula. The authors evaluated education of EBM through a 2-day intensive training course which took place in 2011. The course included didactic lectures as well as interactive hands-on workshops on all topics of EBM. A comprehensive questionnaire, that included the Berlin questionnaire, was used to inspect medical students' awareness of, attitudes toward, and competencies in EBM.

The results were summarised as follows.

The students identified the reasons facing the application of proper EBM practice in Syria, due to the lack of infrastructure and absence of certain facilities, including:

1. EBM teaching module in medical school curriculum (94 %)
2. Role models among professors and instructors (92 %)
3. A qualified librarian (70 %)
4. The institutional subscription to medical journals (94 %)
5. IT hardware (58 %)

After the course, there was a statistically significant increase in medical students' perception and ability to go through steps of EBM, namely:

1. Formulating PICO questions (56.9 %)
2. Searching for evidence (39.8 %)
3. Appraising the evidence (27.3 %)
4. Understanding statistics (48 %)
5. Applying evidence at point of care (34.1 %)

However, mean increase in Berlin scores after the course was 2.68, a statistically insignificant increase of 17.86 %.

The authors pointed out that the road to better EBM application in Syria should begin with teaching EBM in medical school and developing the proper environment to facilitate transforming current medical education and practice to an evidence-based one. Now who can argue with that?

The popularity of EBM is a known and recognised fact. The literature is full of studies and publications supporting, promoting and commending the application of EBM in clinical practice. Some think it should all begin at medical school level. The earlier a student gets to know about the factors involved in research and applied EBM the better the chances of application in clinical practice.

EBM is an important competency for the healthcare professional. Experimental evidence of EBM educational interventions from rigorous research studies is limited. The main objective of the study by Sanchez-Mendiola et al. (2012) was to assess EBM learning (knowledge, attitudes and self-reported skills) in undergraduate medical students with a randomised controlled trial. Their study of the educational intervention was a one-semester EBM course in the 5th year of a public medical school in Mexico. The study design was an experimental parallel group randomised controlled trial for the main outcome measures in the 5th-year class (M5 EBM vs M5 non-EBM groups) and quasi-experimental with static-groups comparisons for the 4th-year (M4, not yet exposed) and 6th-year (M6, exposed 6 months to a year earlier) groups. EBM attitudes, knowledge and self-reported skills were measured using Taylor's questionnaire and a summative exam which was comprised of a 100-item multiple-choice question (MCQ) test.

In their study, a total of 289 medical students were assessed: They were comprised of M5 EBM = 48, M5 non-EBM = 47, M4 = 87, and M6 = 107. There was a higher reported use of the Cochrane Library and secondary journals in the intervention group (M5 vs M5 non-EBM). Critical appraisal skills and attitude scores were higher in the intervention group (M5) and in the group of students exposed to EBM instruction during the previous year (M6). The knowledge level was higher after the intervention in the M5 EBM group compared to the M5 non-EBM group ($p < 0.001$, Cohen's $d = 0.88$ with Taylor's instrument and 3.54 with the 100-item MCQ test). M6 students that received the intervention in the previous year had a knowledge score higher than the M4 and M5 non-EBM groups, but lower than the M5 EBM group.

The inference made by Sanchez-Mendiola and colleagues after the study was that the formal medical student training in EBM produced higher scores in attitudes, knowledge and self-reported critical appraisal skills compared with a randomised control group. They believe that the data from the concurrent groups add validity evidence to the study, but a rigorous follow-up needs to be carried out to document retention of EBM abilities.

The amount of published material is massive. Everyone, anywhere in the world, seems to be engaged in writing and publishing. Obviously it is good for the progress of medicine. However, in that huge volume of published material, not all may be authentic or potent enough to change the public view on a give topic. It has become increasingly difficult to sift through the massive amount of information available on the net to choose the one most pertinent for a given task. Jeffery et al. (2012) investigated the frequency with which topics in leading online evidence-based medical textbooks report treatment recommendations consistent with more recently published research evidence. They believe that the consistency of treatment recommendations of evidence-based medical textbooks with more recently published evidence has not been investigated to date. Inconsistencies could affect the quality of medical care.

In their highly commendable study they investigated the summarised treatment recommendations in 200 clinical topics (i.e. disease states) covered in four evidence-based textbooks—UpToDate, Physicians' Information Education Resource (PIER), DynaMed, and Best Practice–were compared with articles identified in an evidence rating service (McMaster Premium Literature Service, PLUS) since the date of the most recent topic updates in each textbook. Textbook treatment recommendations were compared with article results to determine whether the articles provided different, new conclusions. From these findings, the proportion of topics which potentially require updating in each textbook was calculated.

So, 478 clinical topics were assessed for inclusion to find 200 topics which were addressed by all four textbooks. The proportion of topics for which there was one or more recently published articles found in PLUS with evidence that differed from the textbooks' treatment recommendations was 23 % (95 % CI 17–29 %) for DynaMed, 52 % (95 % CI 45–59 %) for UpToDate, 55 % (95 % CI 48–61 %) for PIER, and 60 % (95 % CI 53–66 %) for Best Practice ((2) (3) = 65.3, $p < 0.001$). The time since the last update for each textbook averaged from 170 days (range 131–209) for DynaMed, to 488 days (range 423–554) for PIER ($p < 0.001$ across all textbooks).

After a really exhaustive study, Jeffery et al. conclude that in online evidence-based textbooks, the proportion of topics with potentially outdated treatment recommendations varies substantially.

Clinical practice in any form and any location is now deeply affected by the EBM. Family practice is the backbone of any nation's health care. Most family doctors have to go through an exhaustive training before they can embark upon solo practice. The demand for family practitioner slots for training in the UK is limited and at present there is tough competition between applicants to secure a training spot. Then they must pass a tough post-training examination called MRCGP, which is facing a lot of criticism at the moment due to the involvement of structure patients. EBM is an absolutely vital tool in the arsenal of family physicians. As we are aware, its concept as the integration of clinical expertise, patient values and best evidence was introduced by David Sackett in the 1980s (Vrdoljak 2012). Scientific literature in medicine is often marked by expansion, accumulation and quick expiration. Reading all important articles to keep in touch with relevant information is impossible. Finding the best evidence that answers a clinical question in general practice (GP) in a short time is not easy.

Vrdoljak (2012) described five useful steps – represented by the acronym 5A + E: assess, ask, appraise, apply and evaluate. The habit of conducting an evidence search on the spot is proposed. Although students of medicine at University of Split School of Medicine are taught EBM from day 1 of their study and in all courses, their experience of evidence-searching and critical appraisal of the evidence, in real time with real patients, is inadequate. Teaching final-year students the practical use of EBM in a GPs office is different and can have an important role in their professional development. It can positively impact on the quality of their future work in family practice (or some other medical specialty) by acquiring this habit of constant evidence-checking to ensure that best practice becomes a mechanism for lifelong learning.

It was concluded by the author that EBM is a foundation stone of every branch of medicine and an important part of family medicine as a scientific and professional discipline. To have an EB answer resulting from GPs everyday work is becoming part of everyday practice.

6.2 Research

Medicine cannot progress without research. It is indeed the backbone of medical science. It allows mankind to move forward, discarding the obsolete and harnessing the latest, the best and the most useful products.

Research is not an extraordinary element. Generally the word itself could be intimidating, but it should not be. Everything in life is based upon experimentation – whether you do that experiment yourself or take advantage of one performed by someone else.

Progress in the medical profession is totally dependent upon research. EBM is just one latest example of research. The entire edifice of EBM is built upon continuous research, evaluation, synthesis, analysis and drawing definite conclusions for further guidance.

EBM primarily concentrates on finding out facts and separating them from fiction. So the first and foremost principle of research based on EBM models is to investigate whether an association exists between *exposure* and the *outcome. If* so then the elements responsible and the outcomes need to be investigated thoroughly (Smith 1992).

Research and audit are two different entities, and should not be confused or interchanged. Research is a scientific process of investigating the correct way to do a certain activity. Audit is a process of checks and balances, designed to investigate whether the activity or an act is done properly and follow the desired pathways to ensure that the thing is done correctly. Research is concerned with discovering the right thing to do, and audit with ensuring it is done correctly (Ellis et al. 2011).

Research involves the exploration of truth. It is a calculated activity, with certain objectives, certain principles, methodologies, statistical analysis and evaluation of results to approve or reject a thought, a hypothesis or a theorem.

It should therefore comprise many attributes which determine the direct outcome of the exercise. It is an expensive exercise, not just in financial terms, but mainly from the viewpoint of hard work, intellectual stress and strain, commitment, personal sacrifices and sometimes adverse personal effects. Research must therefore be based upon fundamental principles of humanity. These values are universal. They are truth, honesty, fair play, equity and justice. To which one might add the individual attributes of the researcher, namely commitment, dedication, hard work and, above all, a sound reason to engage in such an activity.

The importance of research cannot be highlighted more than in a document by Laidlaw et al. (2012). It is a guide written to provide guidance for individuals involved in curriculum design who wish to develop research skills and foster the attributes in medical undergraduates that help develop research. The Guide provokes debate on an important subject, and although written specifically with undergraduate medical education in mind, we hope it is of interest to all those involved with other health professionals' education. Initially, the Guide describes why research skills and related attributes are important to those pursuing a medical career. It also explores the reasons why research skills and an ethos of research should be instilled into professionals of the future. The Guide also tries to define what these skills and attributes should be for medical students and lays out the case for providing opportunities to develop research expertise in the undergraduate curriculum. Potential methods to encourage the development of research-related attributes are explored as are some suggestions as to how research skills could be taught and assessed within already busy curricula. This publication also discusses the real and potential barriers to developing research skills in undergraduate students, and suggests strategies to overcome or circumvent these. Whilst we anticipate that the Guide will appeal to all levels of expertise in terms of student research, we hope that, through the use of case studies, we can provide practical advice to those currently developing this area within their curriculum.

One fundamental question which a researcher may ask himself is: why do research? The question of research should be based upon your firm belief that your efforts will add to existing knowledge and fill the gaps left by previous workers in the same field.

A research hypothesis should be identified right at the beginning. It is a statement on your part as a researcher of what you believe to be right and worthy of research to prove. EBM is therefore employed by the researcher to find evidence to support the hypothesis. If you can prove the hypothesis it becomes a thesis, which would certainly make your effort worthwhile.

After these statements it may sound silly to say one should not be biased in research. And yet '*bias'* is an inseparable component of research.

Bias is defined as the 'systemic deviation from the underlying truth because of the features of a design or the conduct of a study'. It plays a significant role in research studies as we shall see during the discussion. Several forms of biases are mentioned in the literature. Some of the salient ones are briefly mentioned here.

1. Channeling bias
   This is the commonest form of bias and is encountered almost on a daily basis when a clinician prescribes a drug while keeping the prognosis of an ailment in mind. For instance, if a patient suffers with diabetes, the physician may prescribe insulin, an oral anti-diabetic agent or simply control the disease with dietary measures. It is the physician's experience in dealing with similar cases in a certain ethnic or social set-up, which may trigger him to advise on a particular mode of treatment. So in many ways his opinion may be biased in favour of one treatment against another because of the expected prognosis of the ailment and indeed other external factors – such as practical experience, demographic data, or educational activity – which may have influenced his approach.
2. Data completeness bias
   In modern medicine, research is totally dependent upon the employment of first grade computer software. So it is almost mandatory to use computers in all research activities. However, one may sometimes employ the computer decision support system, i.e. CDSS to log an episode in the interventional arm of research and to use a manual or non-CDSS approach in the control group. Such a practice would naturally result in a biased outcome.

3. Detection bias
   Sometimes a researcher may show a tendency to look for an outcome in one of the companion groups, not just routinely, but with an intent and purpose. Such a keen look may obviously result in an outcome with a definite bias. Most researchers would avoid a bias of this nature, although some find it hard to avoid. It may just be an instinctive factor, but could also be an acquired trait.
4. Differential verification bias
   This is a bias often seen in clinical practice, say in the management of a neck lump, where a clinical diagnosis with long terms conservative management may be an option as against an Fine Needle Aspiration Cytology (FNAC) to confirm the nature of the swelling. It may be followed by advice regarding its immediate or long-term management. In other words, results of a test may influence the choice of reference standard. So those who have a laboratory investigation with positive results may be exposed to an invasive investigation such as an open biopsy, as against those with negative results, thus avoiding an invasive procedure even as brief and as common as an FNAC.

   The clinical experience of a clinician plays a major role in such decisions. It must, however, be said that in these days of defensive medical care, even a seasoned warrior may not throw caution to wind and be biased in favour of further investigation, especially if invasive in nature. Such a bias is a byproduct of modern medicine when one has to be extremely careful in case a mistake is made.
5. Expectation bias
   In clinical practice, epidemiological studies play a significant role. If a clinician suspects or knows a certain condition to be present in a given community, or indeed knows that a particular condition does not exist, then an interrogative interview of such a clinician for a particular condition may affect and influence his opinion and therefore outcome of such research. For instance, if an interviewer is looking for a possible association between type 2 diabetes in Asian diaspora in the UK and its complications, knowing well enough that the prevalence of type 2 diabetes is a well known fact, then the study would be labeled as a study showing expectation bias.
6. Incorporation bias
   In many investigative projects involving a diagnostic test, if the test under investigation is used as a ‘reference standard’ then the investigation will show the test to be even more strongly positive than it actually is in highlighting the difference between target positive and target negative. Such a bias would obviously raise the question of the genuineness and authenticity of the research per se.
7. Interviewer bias
   An interview is one of the commonest ways of investigating a certain research hypothesis. It is of particular relevance regarding the questionnaires involving personal interaction with the participants or cohorts in a study. It may suffer bias if more aggressive or more detailed interrogation is given to a participant or a group of cohorts whose particular traits may be known in advance, thus making them somewhat distinct in the group under study.

8. Lead time bias
   One of the common types of research studies involves the assessment, screening and co-relationship between the time a particular conditioned is diagnosed and the length of survival. The outcomes since the diagnosis was made, such as survival, may appear to be increased, not because of prolongation of life per se but because the screening process prolongs the time since the diagnosis was initially made.
9. Length time bias
   As a corollary to lead time bias, length time bias is an interesting concept. Basically it draws upon the statement made in the former bias. According to length time bias, a screening process may discover a clinical condition in the cohorts under study, who subsequently appear to do better in terms of prognosis as compared with the clinically proven cases, merely because the condition discovered through screening is primarily, and naturally, slow and steady in its evolution, with good prognosis, anyway.
10. Observer bias
    This is a fairly common bias seen in observational studies. An observer may be biased in making an observation different based upon the characteristics of the group under study as compared to a control group. In other words, an observer may make systematically differing observations between the subjects under study and their controls. Such a study will be questionable because of its technical reasons demanding removal of the observational bias to draw any significant conclusions.
11. Publication bias
    Honest documentation of the study and its results is a fundamental requirement of ethical medical journalism. It has been duly emphasised in the code of ethics for medical writing. And yet there are many researchers who may publish only those studies which reflect a statistically significant result, discarding those which may not, although they may also be fruitful in other ways. A selective choice of publication based upon encouraging or significant results alone is called publication bias.
12. Reporting bias
    This is in fact a corollary to the above statement. Many researchers are or are not inclined to publish their results depending upon the magnitude, depth, direction and statistically significant values of their results. This is not only a bias; it may also be unethical. There are many scientists who want to maintain their image as the best in the field by selectively reporting and publishing their results. Most are genuine, but history informs us that academic fraud is not entirely unknown!
13. Recall bias
    If two groups of cohorts are exposed to the same experiment, and one or some of a group report an adverse reaction, then comparison is made with the group not showing such a reaction. The adverse reaction group may be likely to recall a different degree or extent of exposure to the other group, even though it may be a perception and not a reality.

14. Referral bias
    If a study involves two groups of patients coming from two different settings for the same study, it would be called a biased study. For instance, looking at, say, hypercholesterolemia in a family practice as against a specialised cardiology unit where such a patient is referred for a specialist advice. Obviously the results of a study like this may not be conducive enough for general purposes, as it carries a bias described as referral bias.
15. Social bias: or a social disability bias
    Alcohol consumption is on the rise in many countries such as the UK. Binge drinking is strongly condemned by the law as well as by society. If a study is carried out to show the prevalence of such an unacceptable practice and the participants respond, bearing in mind the values and norms acceptable to society rather than those actually practiced, then such a study is called a socially biased study.

6.2.1 Diagnostic Bias: Target Positive or Negative

In a diagnostic test case control study, the properties of a diagnostic test are sometimes evaluated in a group of cohorts with the spectrum of disease in what is called a 'Target positive population'. Such a population is so called because the clinician or the researcher may not be certain about the diagnosis. In contrast, a so-called 'target negative' population is one in which the signs and symptoms mimic so closely the target population that a state of confusion might ensue. In fact this group may be totally normal or at least asymptomatic.

Now let us look at the various terms, modalities and tools regularly employed in research.

6.2.2 Incidence

This term is quite commonly used in research. It is often quoted in data collection, subject evaluation, data analysis, results and discussion. It is an indicator of a certain element such as the population involved in a study or research.

Incidence is defined as 'the number of *new cases* of disease reported during a specified period of time, expressed as a proportion of the number of people at risk during that time period'.

The emphasis in defining incidence lies in the words 'new cases'. We shall see the difference in the next item.

6.2.3 Prevalence

This item in research is defined as 'the *number of people* affected by a given condition or disease in a specified period of time'.

The contrast between the term incidence and prevalence is made obvious in their definitions. One deals with the estimation of a problem, reporting only the new cases in a specified time (incidence), the other deals with the magnitude of the problem overall with respect to the number of people affected in a given time.

They both carry due significance in epidemiological studies, research studies, clinical trials and many other scientific studies. Primarily, of course, one hears of the terms incidence and prevalence with reference to epidemiological studies.

6.2.4 Case Study

This is a common clinical form of qualitative research, almost routinely conducted in many types of health delivery services. Hospitalists and internists use it more often than others, though they do not monopolise it, as any dealing with patients in any type of health delivery system may record the experience in this simple scientific documentation. It basically consists of description of a phenomenon in a real life context. It may be an usual presentation or a unique cases, not reported before. A typical example could be a patient presenting with an unusual symptom duly supported by clinical signs, requiring further investigations. The final outcome may be an unusual or rare diagnosis, an atypical surgical manoeuvre, an unusual scan or interesting cytology. Each of these and many similar items can be reported as a case study in a fine journal

Similarly, a series of identical presentations without a control are encountered by a clinician, which may be either rare, unusual, atypical or common, but presenting with unusual features, etc. can be documented as a '*case series*'.

6.2.5 Case Control Study

This is one of the most popular forms of research protocol seen in medical practice. It is designed to investigate the outcome of an experiment or an exposure in a group of patients exposed to a certain risk, with a matching group not exposed to that risk. The patient cohort is labeled as 'case' against the matching group, described as the 'control'. In other words, those subjects with the outcome who are exposed to a potentially harmful factor, known as, cases, are compared with those subjects without an outcome, i.e. unexposed to a potential source of harm. The most obvious illustration could be a cohort of smokers with positive diagnosis of lung cancer and healthy controls of matching demographics. Exposure against outcomes are thus investigated through such observational studies to look at the exposure factor against the outcomes, based upon the data collected over a period of time. Such studies carry a certain advantage in research, as they are fairly economical, friendly, require limited manpower and are fairly effective in research on rare diseases or clinical conditions, albeit with the slight disadvantage of carrying a measurement and an election bias.

6.2.6 Cohort

A common terminology used in research studies involving human subjects or patients is 'cohort'. It basically describes a group of people with common characteristics, attributes, habits and habitats, to be used as part of a study. This group of cohorts is followed up for a period of time to investigate the prevalence or incidence of a certain condition or disease. It is also used to investigate the possible complications or overall prognosis. Cohorts are also employed in many other forms of studies to represent a group of people.

Cohort studies are either prospective or retrospective.

6.2.6.1 Prospective

These studies are exactly the opposite of case control studies, as they involve comprehensive evaluation of such individuals who are normal and free of disease, but have a history of exposure to certain risk factors, as well as those who have not been exposed to such a risk. Both these groups are followed for a prolonged length of time, prospectively with the objective of assessing the development of disease. Furthermore, both these groups are compared for the factor of 'risk' of development of disease. It carries a few advantages, as the cohorts can be assessed before the development of disease and the incidence of disease can be measured. The major advantages are its cost and longevity of time.

6.2.6.2 Retrospective

Such studies investigate cohorts from the past with a known level of risk factor, who are then followed up to the time of the study and continue into the future. They also measure the extent of the disease and compare the risk of disease as compared with the degree of exposure.

6.2.6.3 Prospective Study

This is a standard modality of investigative research often employed in clinical research. A prospective study is spread over a long period of time, designed, for instance, to look at the prospects of a condition developing in a group of people called cohorts on exposure to a certain potential risk. This study is also called a cohort study. Since it looks into the future along a longitudinal axis, it is also called a 'longitudinal study'. A prospective study primarily investigates a cohort of people without an outcome of interest undergoing exposure to a potential risk, a putative cause, a harmful agent, effect or item, compared with a matching cohort also without an outcome of interest but not exposed to potential harm, putative agents or a risk factor. The study is carried out for a period of time in the future to compare and measure the outcomes of interest in both groups (hence prospective).

This form of study is sometimes also carried out by comparing the outcome of an intervention, looking at the effects in those exposed as against those who are not. So basically what is intended here is to outline the effects of an intervention or a procedure in a group against a concurrent group without the procedure.

Such cohort studies are also quite useful in looking at the previous records. So, if someone other than the primary researcher has performed a procedure or an intervention in the past, the present investigator can harness the other person's work to measure the outcome in matching cohorts. In other words, an investigator can look at the retrospective data of a colleague to ascertain the outcome of exposure or intervention. Of course, the past researcher must give consent in writing and the current research must duly acknowledge the work and the worker, both in his documents and his papers.

6.2.7 Cross Sectional Study

This form of observational study compares and determines the outcome measures of certain procedures, interventions and risk factors in the assembled population of exposed and unexposed populations within a specified, measured and calculated, matching time. It is a cross sectional, population-based investigation in which exposure and the existing or prevalent outcomes are duly compared, investigated and evaluated at the same time. A cross section of the given population is thus investigated and duly employed for future research. Such cross sectional studies are of great use in planning future strategies for a given population as they can highlight the problem and prove the value as an indicator for future activity.

6.2.8 Study Involving Health Economics

An extremely potent term used by health economists in their reports based upon their research studies is QALYS or Quality Adjusted Life Years. It has been defines as a unit employed in the measurement of survival, accounting for the effects of suboptimal status of health, resulting in limitations in the quality of life. It is calculated as a unit of measure between 0 and 10. So, for instance, if a patient lives for, say, 10 years after radical treatment for a laryngeal cancer with quality of life compromised by 50 %, because of the obvious handicaps surrounding a laryngectomy and chemo radiation, his QALYS would be calculated as 5 QALYs.

Now let us look at some common and extremely important forms of clinical studies, which literally lay the foundation of clinical application of drugs and medicines. As clinicians we are guided by these studies, conducted elsewhere, often in many parts of the world, before the outcomes are handed down to us as physicians to apply to practical, problem solving acts, resulting in the welfare of mankind.

It is rightly said that a thought is worth a fortune. That thought is then converted into a hypothesis, which is then converted into a chemical formula in a laboratory. The molecule which then develops takes several years of chemical experimentation before a formula for a drug is made. It is presented to the competent authority to approve. It then goes to the scientists to experiment with on animal models. It may take several years before the actual clinical trials begin. If the chain breaks down anywhere along the path, the whole exercise is simply wasted. No wonder, therefore, that the pharmaceutical industry claims it may take up to a quarter of a century to develop a new medicine from a new molecule, thus justifying their patent rights spread over 12 years, before other competitors can cash in with ‘me too’ products.

The following studies are used in the development of such a product.

6.2.8.1 Phase I Study

After many years of animal experiments, the Phase I study is carried out on human volunteers/subjects. It is a controlled, programmed and selective study involving a relatively small group of human subjects.

The sole purpose of Phase I trials is to look at the physiological defects of a given drug and to see if it carries any significant potential risks.

6.2.8.2 Phase II Study

The purpose of this trial is to measure the efficacy, efficiency, usefulness and measured outcomes of a product, drug or medication on healthy human beings. it is also to look for any potential adverse effects, side effects, drawbacks, idiosyncrasies, reactions, harmful effects or any other noteworthy, reportable factor. The major role of Phase II trials is to carry out initial studies on human beings to evaluate the efficiency and effectiveness of the drug under trial.

Many of these subjects are volunteers, though some of them are paid for their services. They are obviously fully informed of the experiment and possible consequences. One such trial went horribly wrong at a London hospital a few years ago, raising the bar of subject protection, consent and remuneration, etc. significantly.

6.2.8.3 Phase III Studies

After the completion of Phase I and II trials, the drug is used for carrying out randomised clinical trials in a large section of population to measure its effectiveness in meeting the goals, and any side effects. In fact this phase of trial basically measures the benefits vs risks, in a large sample of population.

Many countries are involved in such trials thus covering a wide variety of people, with their varied biological and socioeconomic factors influencing the trial per se.

6.2.8.4 Phase IV Studies

These are usually large scale scientific studies carried out on many groups of varied populations in different regions. Its main purpose is to see any adverse reactions or previously unreported side effects in a drug that has already hit the pharmacy shelves and is available on prescription for the consumption of the sick and unwell. The marketing folk often use this study to check out their performance through what is described as 'post marketing surveillance'.

Several terms are used in clinical trials and research studies. One of them is 'placebo'.

6.2.9 Placebo

Placebo is basically an inert substance mimicking the drug under trial in shape, character and presentation. A placebo is used in clinical and therapeutic trials to judge the efficacy, etc. of an active molecule converted into a drug and employed in the treatment of a particular condition. It is almost a regular practice in double blind studies, where it is used as a control arm as against an active arm employing the drug under investigation.

Huge ethical debates crop up in discussions on the use of placebos. One such debate revolves around the use of an inert substance as a control even when the drug has already proved to be effective. Such an exercise is duly called unethical and immoral.

One of the major bones of contention and points of argument between academic minds is that of checking out the credit worthiness of a piece of research. It is a common denominator with many other activities in life. After all, even going for a mortgage, the first thing the lending authority wants to know is your credit history. So everything in life has to be measured in terms of its honesty, integrity and credibility. So the following terms are quite commonly seen in research.

6.2.10 Randomisation

This is a process by which subjects or patients are divided into groups under a study, thereby avoiding a bias, favouritism, preference, etc. The whole exercise is directed towards conducting a scientific, reliable and valid study. The subjects are randomly chosen and divided into two or several groups purely by chance, confounding the variables. Such variables, commonly used in studies under research are age, gender, socioeconomic factors, race and habits, culture, habitats, etc. Random election tables, manual selection or computer selected randomisation are the usual ways of randomisation.

6.2.11 Reliability of a Study

It is a measure of honesty and truth. It basically means that the researcher intends to check the extent to which a given test or a procedure will yield similar results under the controlled experimental environment on all occasions.

6.2.11.1 Validity

This looks at the design of the study to offer credible outcomes or results and conclusions. Validity also looks at whether the strength of the evidence which research offers can withstand the weight of interpretation put upon it.

6.2.11.2 Specificity

A measure of negative cases which test negative.

6.2.11.3 Sensitivity

A measure of positive cases which test positive.

6.2.12 Meta-analysis

One of the essential components of EBM is meta-analysis. It is a statistical method of quantitatively summarizing the results of several research and scientific studies designed to evaluate the same outcome, thus resulting in a single, authentic pool of information, a kind of summary statement to be used by other researchers for guidance and as reference material.

6.2.13 Meta-synthesis

Yet another important component of modern medicine associated with EBM. It involves derailed and comprehensive effort in combining the qualitative research dedicated to a particular topic or subject with the purpose of analyzing the texts of individual studies conducted by several people, comparing and synthesising them with a view to develop and formulate new interpretations.

6.2.14 Writing a Research Report

Any sound research may take several years to complete. Obviously it is not possible without regular interaction with your supervisor. Many things can go wrong during the handiwork. So care and caution must remain on top of your agenda. Throughout the process you must document each activity on your computer, but save a copy elsewhere too. A research report is a very, very special form of medical writing. It is quite different from other forms of writing in many ways. It is your baby. You have worked hard for it. You need to present it to the world as best you can.

The following steps may be followed in writing a research report.

6.2.14.1 Title

Neatly and precisely write down the full title of your study. Ideally you should also develop and write a subtitle. It should discreetly display the purpose of your study. Under that, write down your full name and qualifications, as you normally do in your professional and academic life.

This should be followed by the name of your university, or institutions. Finally, do not forget to mention the date, month and year.

6.2.14.2 Acknowledgements

It is best to reserve a page for acknowledgements at the beginning of your report. You may begin by offering thanks to your supervisor, followed by all those who have guided, advised and helped in any way, form or method in your research. Do not forget your laboratory colleagues, support staff, nursing staff and paramedics, etc. Finally, the statistician who gave you due support all through your research, and the librarians who helped you with referencing, access to databases, books, proceedings, reports or any other reference material. Spousal support is like a rock for a busy research student; which must be duly acknowledged. Without this one may not be able to fulfil one's ambitions.

6.2.14.3 Table of Contents

This page should be carefully prepared. Each segment, each chapter, each component of your text should be duly and chronologically mentioned. Correct page numbers should be given against each item.

6.2.14.4 Abstract

This item is like a face for a body. Extreme care should be taken in the preparation of an abstract. It displays the purpose of your study, aims and objectives, the methodology, the laboratory work, statistical formulae involved, analysis of results, and relevant discussion,; all in brief. It may cover one to two pages of an average thesis.

> **The abstract**
>
> An example:
>
> ‘The project attempts to identify effective teaching and learning strategies and any barriers to learning as perceived by mature students at AUB. Data were gathered from questionnaires, interviews ,observation of and participations in lectures, seminars, and tutorials. The report concludes that there is scope for consideration of more varied approaches to the delivery of curriculum and for consultations with mature students about ways to implement a change.’

6.2.14.5 Aims and Objectives (Taylor 1999)

Aim is a pathway to reach a goal which is an objective. At every stage of our life we need to identify the objective and devise ways to reach that goal. In a study, one obviously identifies the objectives at the outset in the form of a hypothesis. The aim is the material and method employed in conducting the research. So, while writing the report, a researcher should describe the objectives of the research, answering the basic questions such as why was a particular topic or hypothesis chosen and what were the objectives of conducting the present research, clearly identifying the benefits which the reader may obtain. This component of writing should also describe the background of the research and relevance to the previous similar work. Some other workers may have conducted similar studies, and their studies may be of use and relevance to the present work.

This part of the writing should also define the strategies, limitations, difficulties, logistics, funding, ethical, technical, and other elements which may have influenced the study.

6.2.14.6 Literature Search

No research is possible without an exhaustive literature search. In order to investigate a hypothesis, a researcher must delve deep into the published works of other authentic workers.

This used to be a difficult task in the past, as one had to run from a pillar to post to gather the relevant information. Libraries continue to remain a major source of information, but the Internet has changed the complexion of libraries completely. Online books and journals and large databases make the search easy, convenient and free of time constraints.

Brief studies would not need such extensive literature searches, but a dissertation for masters or a doctoral thesis needs a really through search through various search engines, databases, online sources, personal communication and, of course, books.

A fine thesis contains a large amount of literature searched thoroughly and efficiently. It is important that the search is based upon relevant subjects and topics concentrating on your topic. In a doctoral thesis, this component of medical writing covers a fair portion of it. It is best to maintain the record of all the relevant references in an orderly fashion. Nothing could be more frustrating than losing a relevant, pertinent, valuable reference when writing the report, or indeed having an incomplete reference. Perhaps saving it on a computer, on a memory stick or as a paper copy could save a headache or two at the time of documentation.

6.2.14.7 Data Collection

The main body of your work revolves around the pivot of data. This component of the write-up should describe at length the methodology of data collection, the sample size, the method of selection, the criteria for inclusion or exclusion of subjects or patients and the parameters chosen for assessment or evaluation. Describe and discuss the reason for choosing the method, supporting this with relevant arguments and persuading the reader to agree with your choice as being the best possible method for your study. Obviously if you are not entirely convinced that the method you chose is best, then you would not choose not indeed recommend it. All the more reason to justify your methodology with confidence. The write-up should then move on to give detailed accounts of the procedure, the choice of variables and the controls. The all-important item of statistical analysis and tests of measurement should be given due place in the write-up.

6.2.14.8 Results and Analysis

The entire effort made during the study and its write-up is concentrated in this component. The results actually constitute the main body of the write-up. There are various ways of compiling the results. A good quality write-up consists of tables, charts, graphs, figures, etc. and each item must be labeled accordingly. For instance, a chart is a chart, not a table. Likewise a figure should not be labeled as a chart and so forth.

Numerous pieces of software are now available which can make a medical write-up not just beautiful but also self explanatory. As we rightly said ‘a picture is worth a thousand words’. So a chart or a graph may save you from writing a paragraph.

One must remember to give a number to the graph or table and simply refer to it while briefly highlighting its message. Many young writers make the mistake of repeating in the text what they have already displayed in a figure. The editors of journals do not like it at all, as repetition of a statement is not to be commended – printing and publication is an expensive practice. This is why many top journals such as The Lancet, JAMA and BMJ leave no space at all between papers or write-ups.

6.2.14.9 Analysis and Discussion

Discussion is the part of your thesis which is the very soul of your research. It is dedicated to the study you have carried out, and the results you have obtained. In this component, one should begin with the statement of the problem you had embarked upon such a long time ago, because by the time you have reached this stage much water has flowed under the bridge. The problem may have been solved or may have remained unsolved, but in the discussion, you should hold your position firm, and discuss the nature of the hypothesis, followed by an explanation of the reasons as to how has it added to existing knowledge and made the world a better place with your scientific contribution.

During the discussion, your objective should be to provide sufficient evidence to prove your null hypothesis. If your evidence rejects your hypothesis, that should also be documented.

In the discussion, one major task of the writer is to identify – indeed highlight – the deficiencies your study may have left revealed or the points of relevance which time did not allow you to dwell upon. It is of importance for your followers in the same field of research– at some stage particular aspects of knowledge which you had initiated will be disseminated thoroughly and beneficially. A story that remains incomplete must be completed by a follower, who should be guided by the predecessor. So, leaving your footprints indicating the direction in which you would want your study to proceed is very desirable.

Nobody can fully complete any study in a life time. It takes generations of scientists to reach a final conclusion. The famous story of the so-called God particle, alias the Higgs boson or Higgs particle, began a whole life time ago. In fact Peter Higgs, who has just been awarded the Nobel prize, did not expect it to be discovered in his life time. It was thanks to the Large Hadrons Collider and massive efforts in terms of resources at the global level that a monumental success was witnessed by this great scientist in July 2012. He then said that now the real work begins…. So no research can call itself fully and comprehensively completed despite unparalleled success such as in this case.

Discussion may not become irrelevant as a lengthy and unrelated discussion can seriously harm a thesis. It must be based upon your personal endeavours and concentrate on the defence of your results. That indeed is the crux of the matter.

Involve a statistician in your research from the moment you begin thinking about conducting research. Or, even better, learn the biostats yourself to apply the formulae and equations appropriate to your research. You must also explain the statistical formulae employed during your research and how they were useful in helping you reach a conclusion. (A sample of commonly used software and formulae is given at the end of this chapter)

The p value, or the *t* test as well as the other complex formulae are best discussed with the help of your statistician, who is part and parcel of your research from day 1. His contribution, as indeed that of all those who have helped you in your research and documentation, should be duly acknowledged.

6.2.14.10 References/Bibliography

No medical write-up is complete without the support of references. They must be genuine, authentic, original, contemporary and global as well as regional. Most writers employ either the Harvard or Vancouver method of referencing. These were designed and agreed by global editorial authorities many years ago and are still in vogue:

Harvard…. Authors name, Title, Year of publication, Vol. no. first and last page.

Vancouver…. The references are tabulated as they appear in the text

Each journal, book, university, institution may have its own style, which is published in their pages called 'instructions to the author'. Always read this it before listing your references.

Computers have once again made life easy as many pieces of software such as Endnote are now available for any writer. They can compile your references, store them, and add them to your text at your command.

Here is an example of promoting research in medical institutions. Wojtecki et al. (2007) discuss in their paper that teaching clinicians about research by generating projects from clinical practice, expertise and interest could be a way of promoting research.

They discuss their methodology whereby classes were co-taught by the hospital biostatistician and clinical nurse specialist in consultation with one of the authors. Hospital clinicians were taught how to initiate and design their study as a follow-up to a Basic Research Skills course previously co-taught by one of the authors. After an early attrition of 4, 14 remaining clinicians attended 10 weekly 1-h classes with an average overall attendance rate of 79.5 %. Of the 14, 8 (57 %) completed pre- and post-tests, with significant improvement in scores from 51 % pre-test to 75 % post-test. From the 14 clinicians, 6 research projects were generated.

As discussed earlier in this book, medicine cannot progress without continued research. To confine research only to the basic scientists, without involving the clinicians from the outset, is akin to the traditional curriculum. In that format of imparting education, basic subjects were taught independent of clinical subjects, so there was a kind of disruption or discontinuity in the subjects. We believe that research should be conducted across the board by both clinicians and basic scientists. Since this has not happened, a niche has developed, which is a fresh career for a few bright medical students to undertake a full clinical training duly complemented with a doctorate to conduct the basic research and to apply the outcomes in their practical lives. The authors demonstrated that even busy clinicians can be engaged in the process of developing research projects. An unexpected benefit was the demonstration of mutual respect when sources of expertise taught and learned together.

An article by Boet et al. (2012) provides clinician-teachers with an overview of the process necessary to move from an initial idea to the conceptualisation and implementation of an empirical study in the field of medical education. This article allows clinician-teachers to become familiar with educational research methodology in order to (1) critically appraise education research studies and apply evidence-based education more effectively to their practice and (2) initiate or collaborate in medical education research

This review used relevant articles published in the fields of medicine; education, psychology and sociology before October 2011. They believe the focus of the majority of research in medical education has been on reporting outcomes related to participants. There has been less assessment of patient care outcomes, resulting in informing evidence-based education to only a limited extent. The article explains the process necessary to develop a focused and relevant education research question and emphasises the importance of theory in medical education research. It describes a range of methodologies, including quantitative, qualitative and mixed methods, and concludes with a discussion of the dissemination of research findings. A majority of studies currently use quantitative methods. This article highlights how further use of qualitative methods can provide insight into the nuances and complexities of learning and teaching processes.

Boet et al. concluded that research in medical education requires several successive steps, from formulating the correct research question to deciding the method for dissemination. Each approach has advantages and disadvantages and should be chosen according to the question being asked and the specific goal of the study. Well-conducted education research should allow progression towards the important goal of using evidence-based education in our teaching and our institutions.

Medical education research has grown enormously over the past 20 years, but it does not make sufficient use of theories according to influential leaders and researchers in this field (Dolmans and Tigelaar 2012).

In this AMEE Guide, it is argued that design-based research (DBR) studies should be conducted much more in medical education design research because these studies both advance the testing and refinement of theories and advance educational practice. In this Guide, the essential characteristics of DBR and how DBR differs from other approach such as formative evaluation are explained. It is also explained what the pitfalls and challenges of DBR are. The main challenges deal with how to insure that DBR studies reveal findings which are of a broader relevance than the local situation and how to insure that DBR contributes toward theory testing and refinement. An example of a series of DBR studies on the design of a teaching portfolio in higher education aimed at stimulating a teacher's professional development is described to illustrate how DBR studies actually work in practice. Finally, it is argued that DBR-studies could play an important role in the advancement of theory and practice in the two broad domains of designing or redesigning work-based learning environments and assessment programs.

Health professionals as well as practitioners and trainees are expected to engage in self-regulation of their learning and practice. For example, doctors are responsible for identifying their own learning needs and pursuing professional development opportunities, medical residents are expected to identify what they do not know when caring for patients and to seek help from supervisors when they need it, and medical school curricula are increasingly called upon to support self-regulation as a central learning outcome (Brydges and Butler 2012). Given the importance of self-regulation in both health professions education and ongoing professional practice, our aim was to generate a snapshot of the state of the science in medical education research in this area

To achieve this goal they gathered the literature focused on self-regulation or self-directed learning undertaken from multiple perspectives. Then, with support from a multi-component theoretical framework, they created an overall map of the themes addressed thus far and the emerging findings. Brydges and Butler then proceeded from that integrative overview to consider contributions, connections and gaps in research on self-regulation to date.

Based on this reflective analysis, they concluded that the medical education community's understanding about self-regulation will continue to advance as we: (1) consider how learning is undertaken within the complex social contexts of clinical training and practice; (2) think of self-regulation within an integrative perspective which allows us to combine disparate strands of research and to consider self-regulation across the training continuum in medicine, from learning to practice; (3) attend to the grain size of analysis both thoughtfully and intentionally; and (4) most essentially, extend our efforts to understand the need for and best practices in support of self-regulation.

Public health is duly recognised as a subject of major importance by the global agencies like the WHO et al. Yet very little effort is made by the medical schools to teach this essential subject through direct exposure to the community needs and its role in maintaining health standards. Dongre et al. (2011) carried out a much needed study in India, where there has been little effort to teach medical students about public health research. Few medical institutions in India and nearby Nepal formally offer exposure to field surveys or projects to medical undergraduates as a part of their training in community medicine. Little is known about the effect of such activity on students or how they apply what they learn. We implemented a systematic, hands-on experience in public health research process with medical undergraduates in Puducherry, India to evaluate its effect on students

They identified 2 groups, each with 30 third-semester (2nd-year) medical undergraduates, who participated in a 15-day, 2.5 h/day course on the public health research process. At the end of the course, a retrospective post- then pre-self-assessment of students' skills was obtained. A year later, they resurveyed students with open-ended questions to assess their impressions of what they had gained from learning about the field survey process.

The study revealed that out of the 60 students, 55 (91.6 %) provided complete responses for analysis. The mean post-exposure Likert scores of students' self-perceived skills and knowledge were significantly higher than their retrospective assessments of themselves before the course in areas such as being aware of the public health research process, their skills in interviewing and communicating with local villagers and their ability to collect, enter via computer and present gathered information ($p < 0.005$). Six categories of common responses, all positive, emerged from the open-ended feedback: (1) ability to apply learning to research work, (2) communication skills, (3) awareness about local epidemiology of injury, (4) awareness of local first-aid practices and health care seeking behaviour, (5) awareness of survey techniques and (6) anticipated application of this learning in the future and its effect on the student. It was thus concluded that the initial implementation of a program exposing medical students to the community survey research process was well received. Early exposure of medical undergraduates to the survey research process appears to help them be better clinicians, able to understand and use field level data.

The distinction between the basic sciences and clinical sciences is ageless. It has, however, been submerged into the current flow of integrating both into one, imperceptibly and knowingly. It is hoped by the promoters of integrated curricula that the teaching and learning of the basic sciences will become more affirmative, timely and appropriate to the teaching of clinical subjects. Furthermore, the teaching of the basic sciences will spread out throughout the curriculum covering all years at the medical school.

Basic science departments in academic medical centres are influenced by changes which are commonly directed at medical education and financial gain. Some such changes may have been detrimental to or may have enhanced basic science education (John 2011). They may have determined the basic science research focus or basic science research methods. However, there is a lack of research on the educational process in the basic sciences including training of PhDs, while there is ample research on medical education pertaining to training of medical doctors.

The author identifies here, from the university websites and available literature, some forces which have driven teaching and research focus and methods in state-of-the-arts academic medical centres recently with a view to seeing through their possible influences on basic science education and research, using the United States of America as an example.

The author identified that the "forces" to be: changes in medical schools; medical educational philosophies: problem based learning, evidence based medicine, cyber learning and self-directed learning; shifting impressions of the value of basic sciences in medical schools; research trends in the basic sciences: role of antivivisectionists, alternative experimentations, explosion of molecular and cell biology; technological advancements; commercialisation of research; and funding agencies. The author encourages African leaders in academia to pay attention to such forces as the leadership seeks to raise African Universities as centres of knowledge that have a major role in acquiring, preserving, imparting and utilizing knowledge.

Dedicated research time is usually part of a contract in major institutions both in the US and UK. There have been voices challenging the proper utilisation of that time, as the managers feel the same time could be best used in treating more patients. It is a problem which is plaguing the current climate of managed health care.

Bhattacharya et al. (2011) looked at dedicated research time during the general surgery training programs, offering a dedicated research experience during the training period. There is much debate over the importance of these experiences with added constraints placed on training surgeons, including length of training, Accreditation Council of Graduate Medical Education limitations, and financial barriers. They quantified the impact of a protected research experience on graduates of a university-affiliated general surgery training program. We surveyed all graduates of a single university-affiliated general surgery training program who completed training from 1989 to 1999. Data were obtained for all the subjects. Most graduates (72/73; 98.6 %) completed a dedicated research experience (range: 1–5 years). Presently, 72.6 % (53/73) are practicing academic surgery and 82.5 % (60/73) are engaged in research activities. Of 73 graduates, 51 (69.5 %) have current research funding including 32.9 % (24/73) with National Institutes of Health funding. Of all graduates, 42.5 % (31/73) have become full professors with 20.2 % (15/73) division/section chiefs and 14.3 % (10/73) department chairmen or vice-chairmen. Those trainees achieving a career in academic surgery were statistically more likely to have committed 2 or more years to a protected research experience during training

($p < 0.05$), fellowship training after general surgery residency ($p < 0.01$) and a first job at an academic institution upon completion of training ($p < 0.001$). Bhatacharya et al. believe that understanding the importance of resident research experiences while highlighting critical factors during the formative training period may help to ensure continued academic interest and productivity of future trainees.

Another study on a similar topic was conducted by Dhungel et al. in 2011. It involved a comparison of research experience, fellowship training and ultimate practice patterns of general surgery graduates at a university-based surgical residency program. Research experience correlated with pursuing fellowship training and predicted an eventual academic career. More recently, graduates have been able to obtain fellowships without a dedicated research year, perhaps reflecting shifting fellowship training opportunities.

They hypothesised that the relationships between dedicated researchers during residency, fellowship training and career choices are changing as research and fellowship opportunities evolve.

The aim was the comparison of research experience, fellowship training and ultimate practice patterns of general surgery graduates over two decades (1990–1999, $n = 82$; 2000–2009, $n = 98$) in a university-based residency program. The main outcome measures were number of years and area of research, fellowship training and practice setting.

Dhungel et al. (2011) discovered that, when compared by decade, graduates became increasingly fellowship-trained (51.2 % vs 67.3 %; $p < 0.05$) and pursuit of fellowship training increased for both research and non-research participating graduates. The number of residents completing more than 1 year of research doubled (9.8 % vs 22.4 %, $p < 0.05$). By decade, the percentage of female graduates increased significantly (22 % vs 41 %, $p = 0.005$), with more women participating in dedicated research (17 % vs 51 %, $p < 0.001$) and seeking fellowships. The number of graduates going into specialty practice and academic/clinical faculty positions increased over time.

It was therefore concluded that the surgical residents had completed more dedicated research years and became increasingly fellowship-trained over time. The proportion of female graduates had increased with similar increases in research time and fellowship training in this subgroup. In the earlier decade, dedicated research experiences during surgical residency correlated with pursuing fellowship training, and predicted an eventual academic career. More recently, they noted that the graduates had obtained fellowships and academic positions without dedicated research time, perhaps reflecting shifting fellowship opportunities.

Qualitative research in medical education is essential for the progress of this specialty. Hanson et al. (2011) aimed to equip readers with a basic understanding of qualitative research and prepare them to judge the difference between qualitative research and their own research questions. The authors provide an overview of the reasons for choosing a qualitative research approach and potential benefits of using these methods for systematic investigation.

They also discuss developing qualitative research questions, grounding research in a philosophical framework, and applying rigorous methods of data collection, sampling and analysis. They also address methods to establish the trustworthiness of a qualitative study and introduce the reader to ethical concerns warranting special attention when planning qualitative research. They concluded with a worksheet which readers may use for designing a qualitative study. Medical educators ask many questions which carefully designed qualitative research would address effectively. Careful attention to the design of qualitative studies helps to ensure credible answers , illuminating many of the issues, challenges and quandaries arising while doing the work of medical education.

AMEE is an extremely active organisation. It is constantly engaged in improving the science and art of medical education. Its membership has grown over the years, and it is now considered to the major source of guidance in nearly all fields of medical education. Here is one illustration.

This AMEE guide. Ringsted et al. (2011) offers an introduction to research in medical education. It is intended for those who are contemplating conducting research in medical education but are new to the field. The guide is structured around the process of transforming ideas and problems into researchable questions, choosing a research approach appropriate to the purpose of the study and considering the individual researcher's preferences and the contextual possibilities and constraints. The first section of the guide addresses the rationale for research in medical education and some of the challenges posed by the complexity of the field. Next is a section on how to move from an idea or problem to a research question by placing a concrete idea or problem within a conceptual, theoretical framework. The following sections are structured around an overview model of approaches to medical education research, 'The research compass'. Core to the model is the conceptual, theoretical framework which is the key to any direction. The compass depicts four main categories of research approaches which can be applied when studying medical education phenomena: 'Explorative studies'; 'Experimental studies'; 'Observational studies'; and 'Translational studies'. Future AMEE guides in the research series will address these approaches in more detail.

Much emphasis is being laid on the importance of research at undergraduate level. It varies from region to region and from school to school. The role of the faculty in encouraging and prompting research amongst the medical students cannot be overemphasised. The American University of Barbados is a fine example to follow. The medical school is not even a year old, but because of the active interest of a professor of pathology, who himself is a keen research scientist, the students participated in international research and have already published the first ever paper from this young medical school (Bukhari et al. 2013).

The point was highlighted in a study by de Oliveira et al. (2011). They believe that research activity is not a mandatory component of medical education in many developing countries, including Brazil, although such experiences can have a positive impact on the quality of medical education. The interest and involvement of medical students in research and the barriers they face in accessing research training in developing countries have not been adequately addressed.

They wanted to assess the availability of scientific training programs in Brazilian medical schools, the degree of involvement of medical students in these programs, the main barriers to student involvement in research and possible reasons for the lack of scientific training programs.

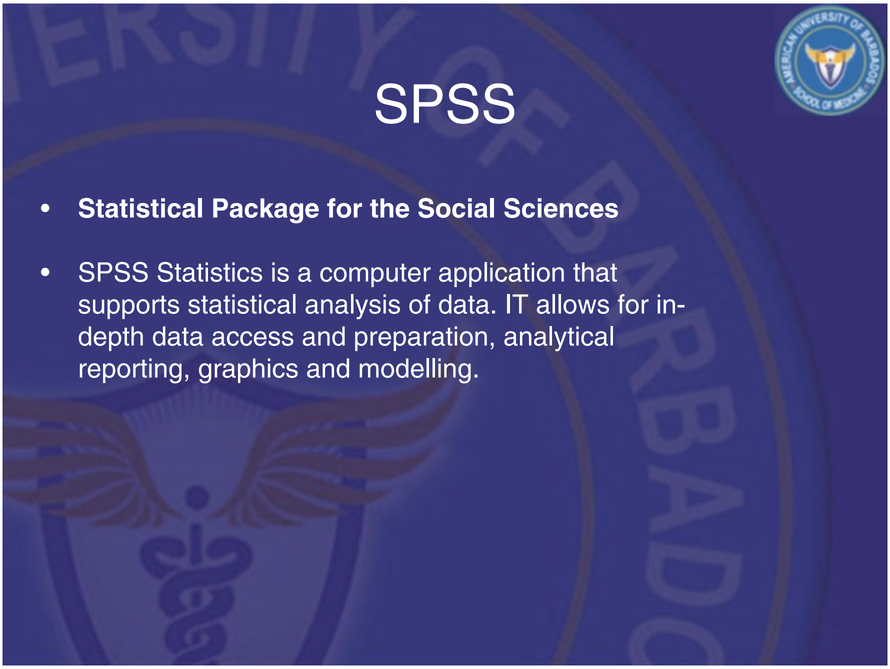
This study examined 13 medical programs conducted in six Brazilian states. A total of 1,004 medical students were interviewed. We evaluated the availability of scientific training in the institutions attended by these students, the participation of the students in such activities and students' reasons for not joining such programs based on students' answers to our questionnaire.

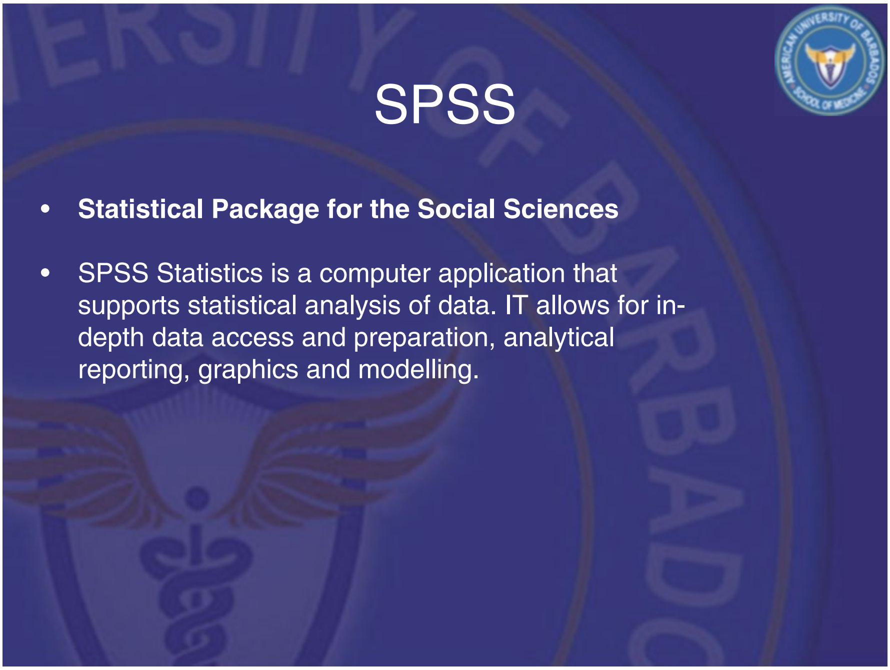
The study informed the authors that, although only 7 % of the medical students expressed no interest in research, only 60 % of them were involved in research training. Students regarded a lack of institutional incentive as the most significant barrier to their participation in research activities. Other significant barriers included defective infrastructure and insufficient time available for professors to mentor undergraduate students. According to the feedback from the students, 8 of the 13 schools investigated featured structured programs for scientific training. However, a mean of only 47 % of students participated in scientific training programs on their campuses and 13 % of students were compelled to pursue such activities off-campus.

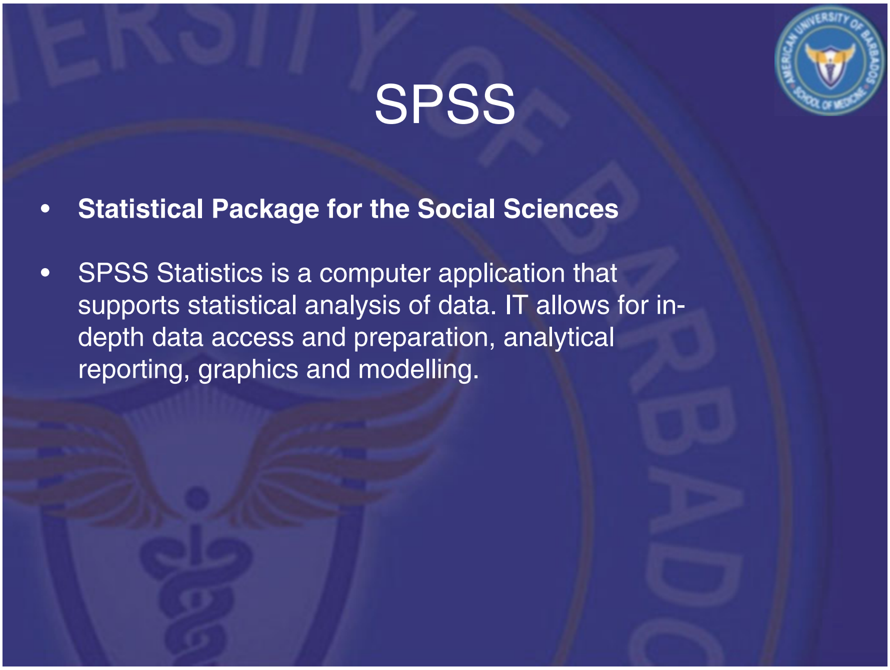
It was therefore concluded that, although scientific training during medical education in Brazil is still less frequent than expected, most of the students were interested in research activities.

No research is possible without the support of a statistician. It is simply the most fundamental element at AUB. Here is a presentation of an introduction to biostatistics in research (Courtesy Vishi Singh).

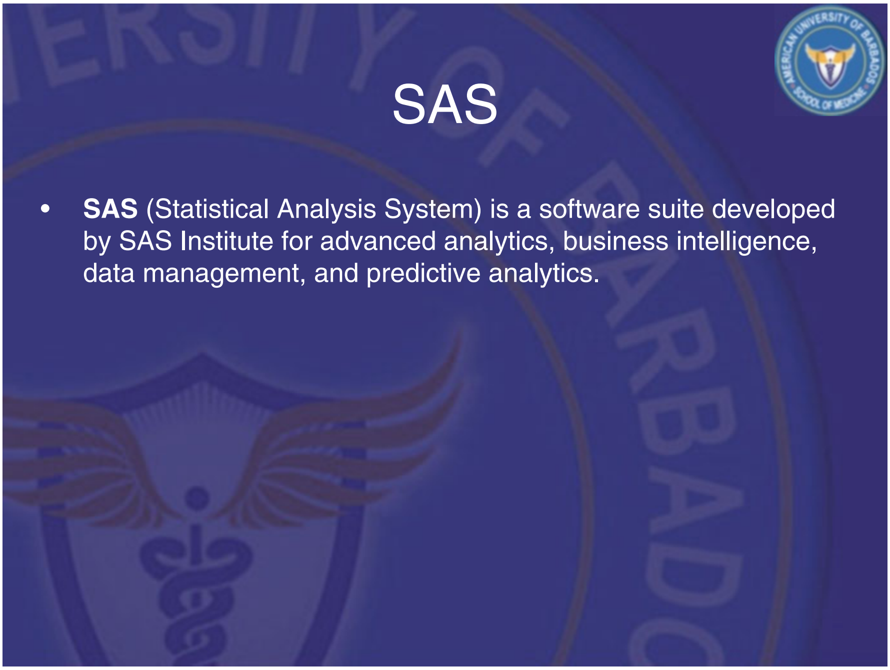
Statistical Data Packages and Their uses

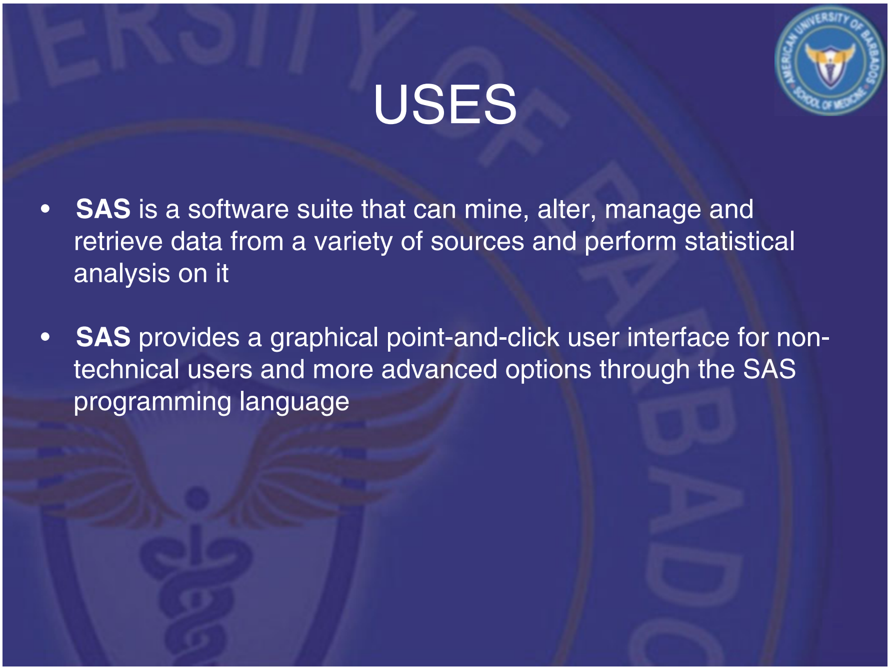


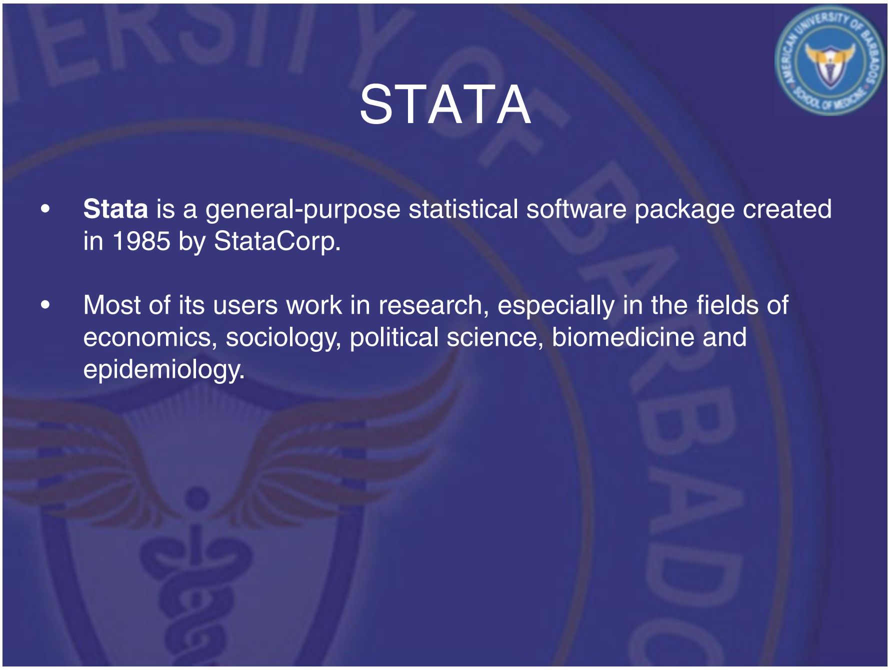

SPSS
Statistical Package for the Social Sciences
SPSS Statistics is a computer application that supports statistical analysis of data. IT allows for in-depth data access and preparation, analytical reporting, graphics and modelling.

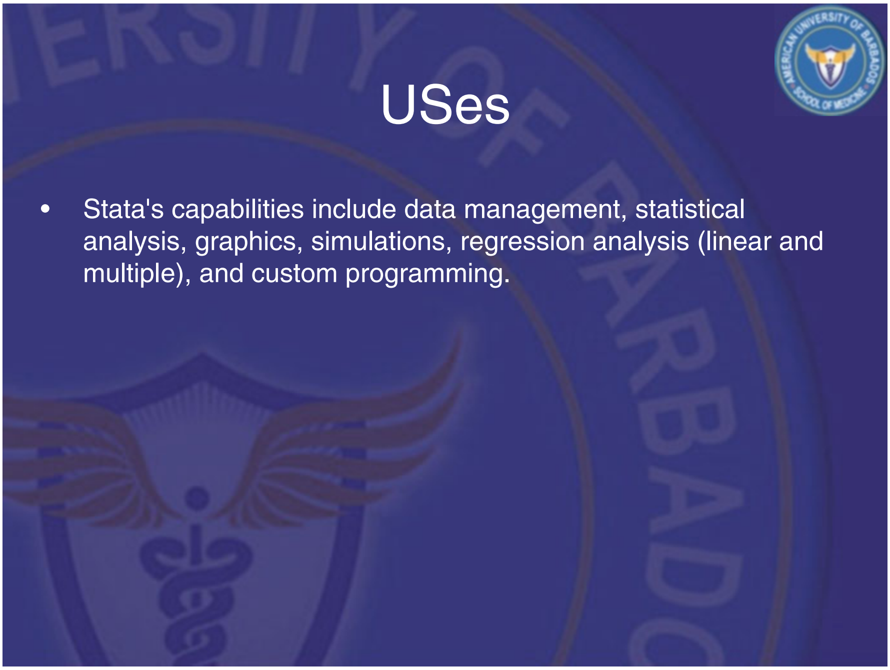

SPSS
Statistical Package for the Social Sciences
SPSS Statistics is a computer application that supports statistical analysis of data. IT allows for in-depth data access and preparation, analytical reporting, graphics and modelling.

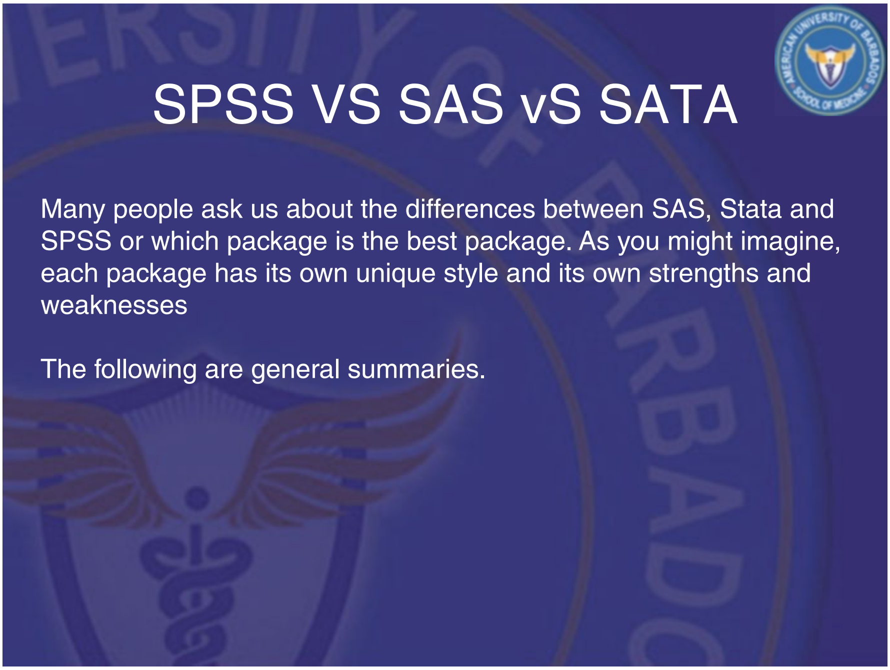

USes
• Widely used program forstatistical analysisinsocial sciences. It is also used by market researchers, health researchers, survey companies, government, education researchers, marketing organizations, data miners,and others.


SAS
• **SAS** (Statistical Analysis System) is a software suite developed by SAS Institute for advanced analytics, business intelligence, data management, and predictive analytics.

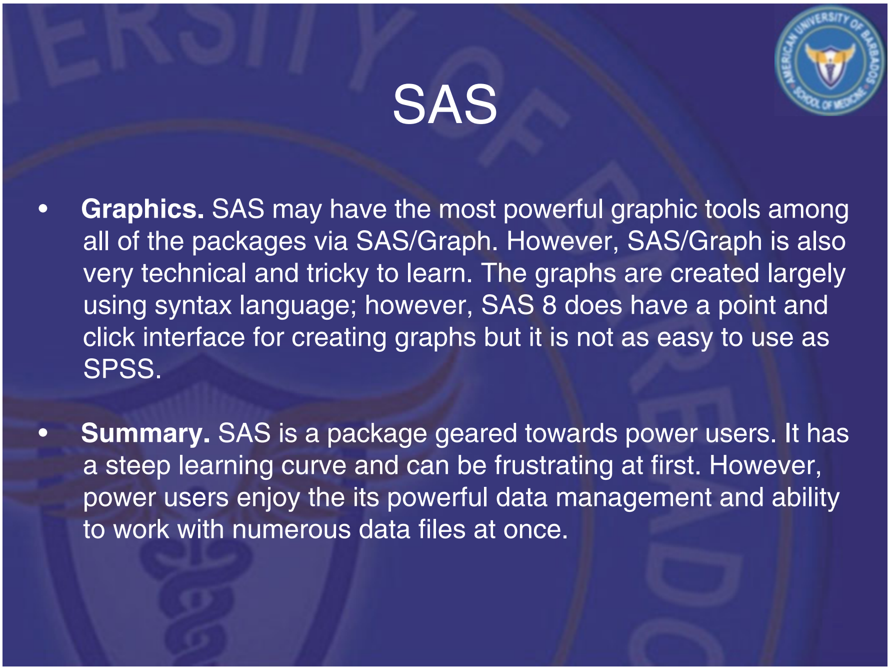

USES
• SAS is a software suite that can mine, alter, manage and retrieve data from a variety of sources and perform statistical analysis on it
• SAS provides a graphical point-and-click user interface for non-technical users and more advanced options through the SAS programming language

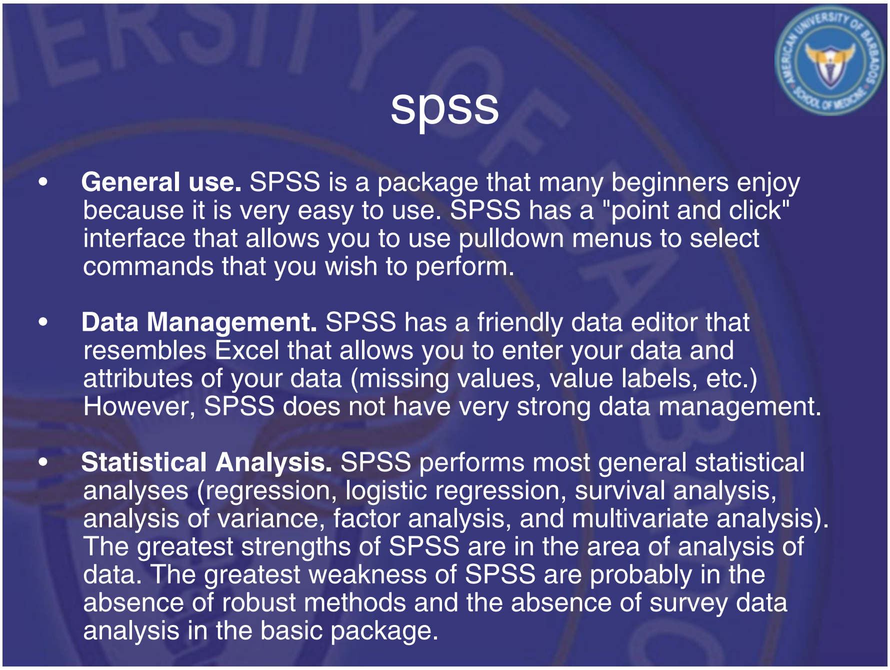

STATA
• Stata is a general-purpose statistical software package created in 1985 by StataCorp.
• Most of its users work in research, especially in the fields of economics, sociology, political science, biomedicine and epidemiology.

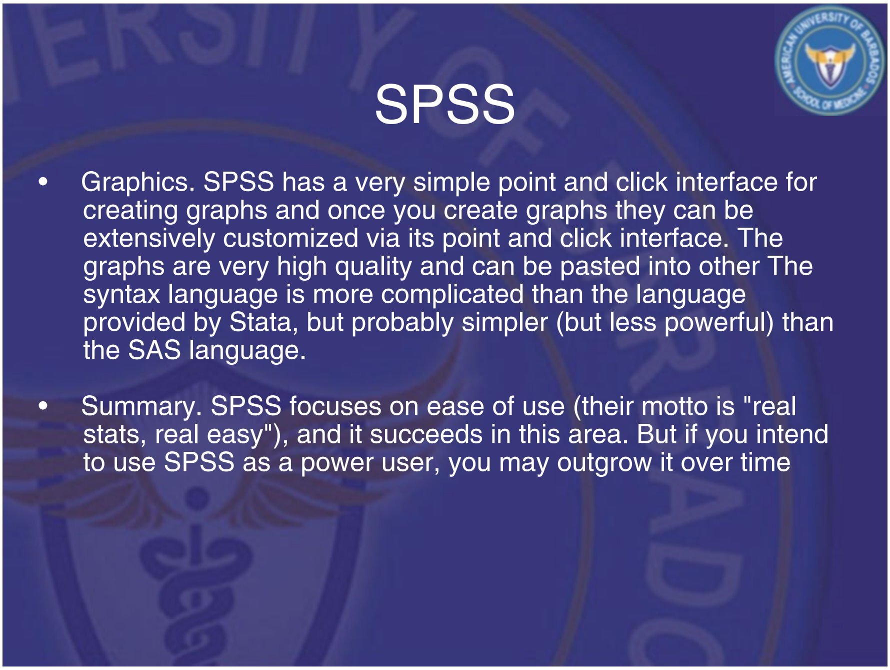

USes
• Stata's capabilities include data management, statistical analysis, graphics, simulations, regression analysis (linear and multiple), and custom programming.

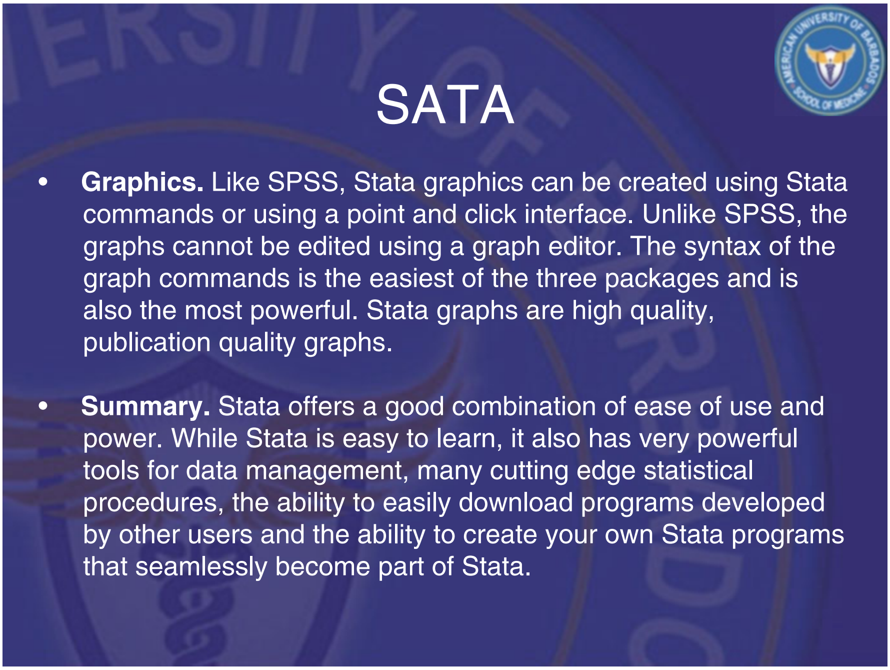

SPSS VS SAS vS SATA
Many people ask us about the differences between SAS, Stata and SPSS or which package is the best package. As you might imagine, each package has its own unique style and its own strengths and weaknesses
The following are general summaries.


Sas
General use. SAS is a package that many "power users" like because of its power andprogrammability. Because SAS is such a powerfulpackage, it is also one of the most difficult to learn.
Data Management. SAS is very powerful in thearea of data management, allowing you to manipulateyour data in just about any way possible.
Statistical Analysis. SAS performs most generalstatistical analyses. While there is some support forthe analysis of survey data, it is quite limited ascompared to Stata.

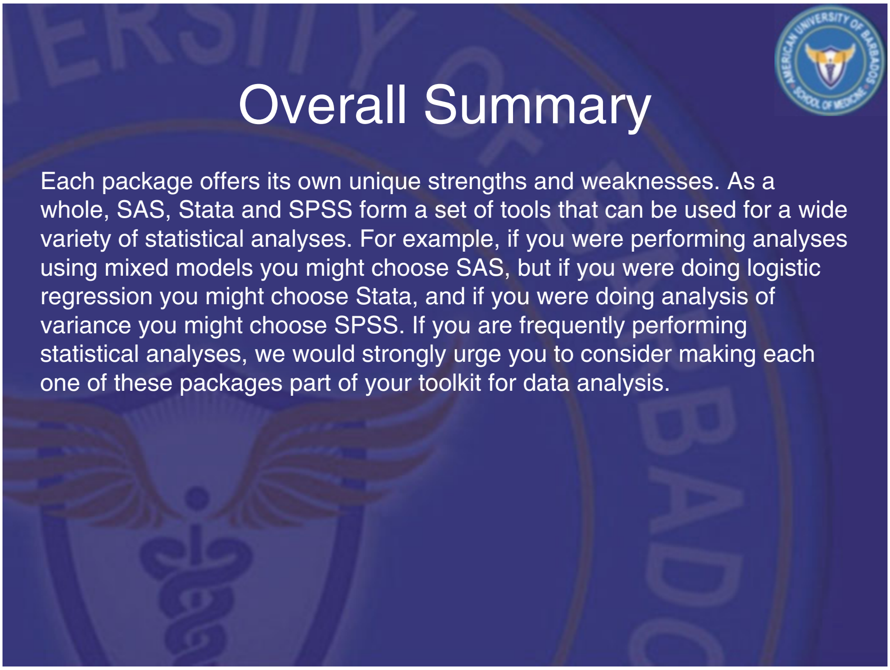

SAS
Graphics. SAS may have the most powerful graphic tools among all of the packages via SAS/Graph. However, SAS/Graph is also very technical and tricky to learn. The graphs are created largely using syntax language; however, SAS 8 does have a point and click interface for creating graphs but it is not as easy to use as SPSS.
Summary. SAS is a package geared towards power users. It has a steep learning curve and can be frustrating at first. However, power users enjoy the its powerful data management and ability to work with numerous data files at once.

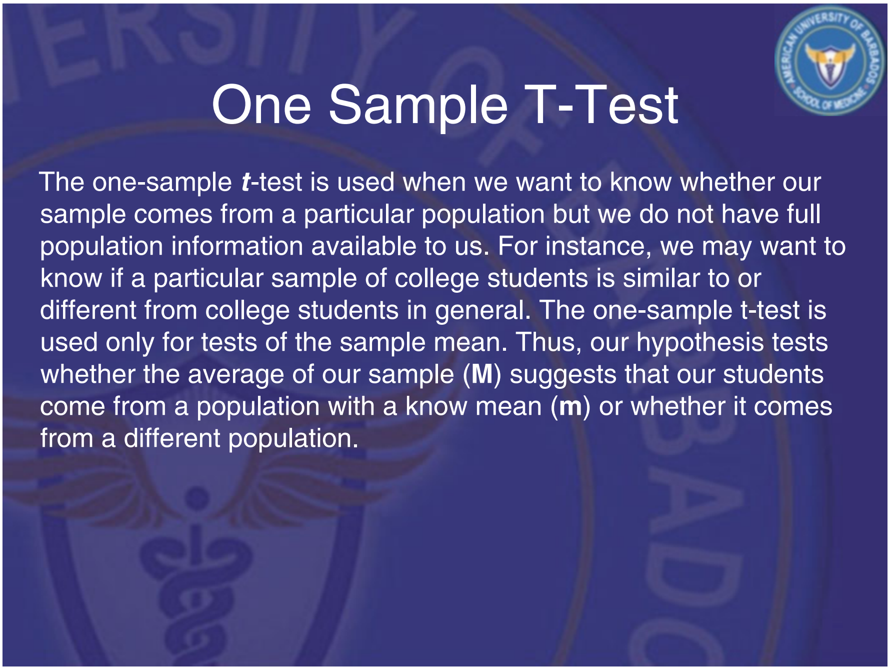

spss
• **General use.** SPSS is a package that many beginners enjoy because it is very easy to use. SPSS has a "point and click" interface that allows you to use pulldown menus to select commands that you wish to perform.
• **Data Management.** SPSS has a friendly data editor that resembles Excel that allows you to enter your data and attributes of your data (missing values, value labels, etc.) However, SPSS does not have very strong data management.
• **Statistical Analysis.** SPSS performs most general statistical analyses (regression, logistic regression, survival analysis, analysis of variance, factor analysis, and multivariate analysis). The greatest strengths of SPSS are in the area of analysis of data. The greatest weakness of SPSS are probably in the absence of robust methods and the absence of survey data analysis in the basic package.

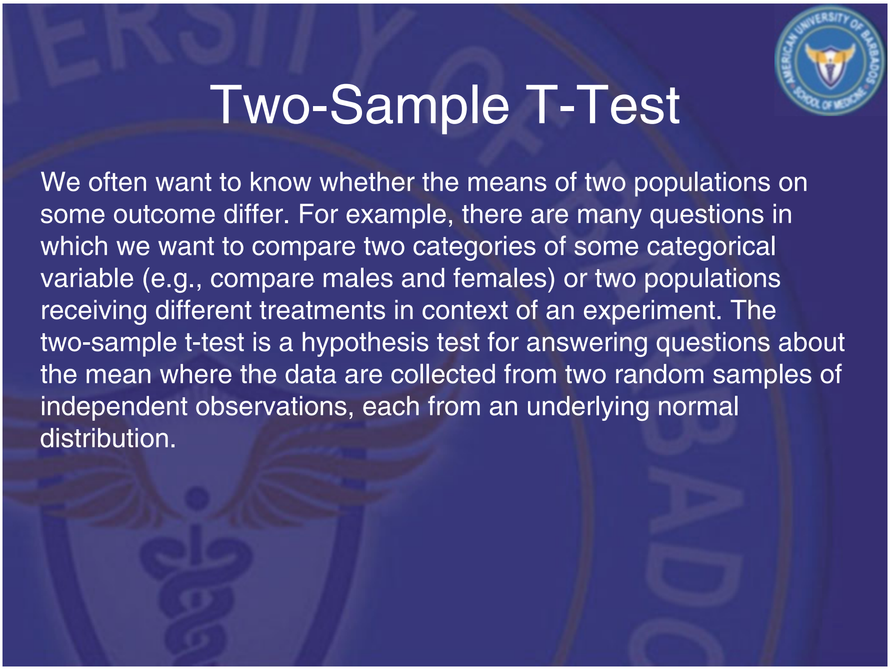

SPSS
• Graphics. SPSS has a very simple point and click interface for creating graphs and once you create graphs they can be extensively customized via its point and click interface. The graphs are very high quality and can be pasted into other The syntax language is more complicated than the language provided by Stata, but probably simpler (but less powerful) than the SAS language.
• Summary. SPSS focuses on ease of use (their motto is "real stats, real easy"), and it succeeds in this area. But if you intend to use SPSS as a power user, you may outgrow it over time

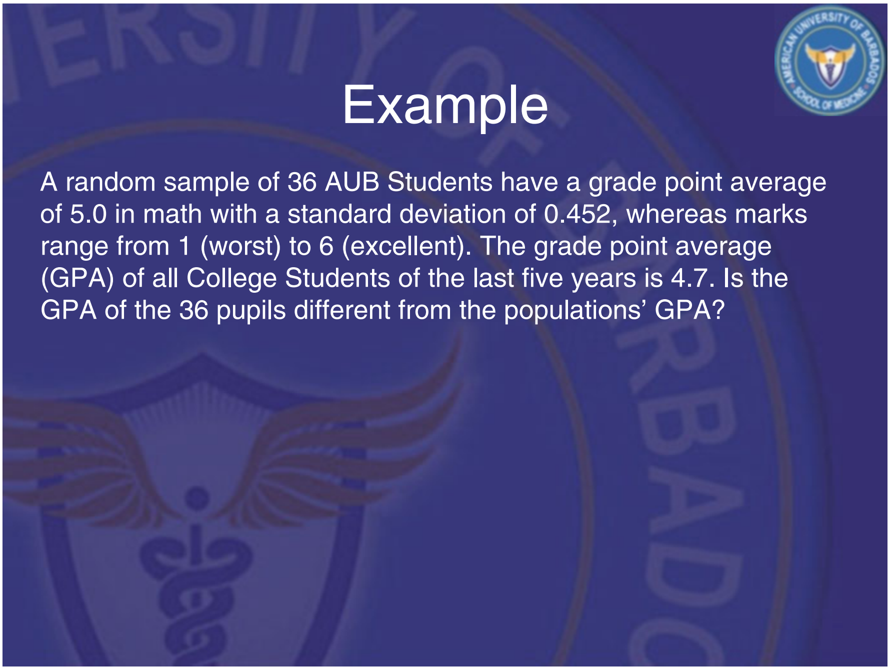

SATA
• **Graphics.** Like SPSS, Stata graphics can be created using Stata commands or using a point and click interface. Unlike SPSS, the graphs cannot be edited using a graph editor. The syntax of the graph commands is the easiest of the three packages and is also the most powerful. Stata graphs are high quality, publication quality graphs.
• **Summary.** Stata offers a good combination of ease of use and power. While Stata is easy to learn, it also has very powerful tools for data management, many cutting edge statistical procedures, the ability to easily download programs developed by other users and the ability to create your own Stata programs that seamlessly become part of Stata.

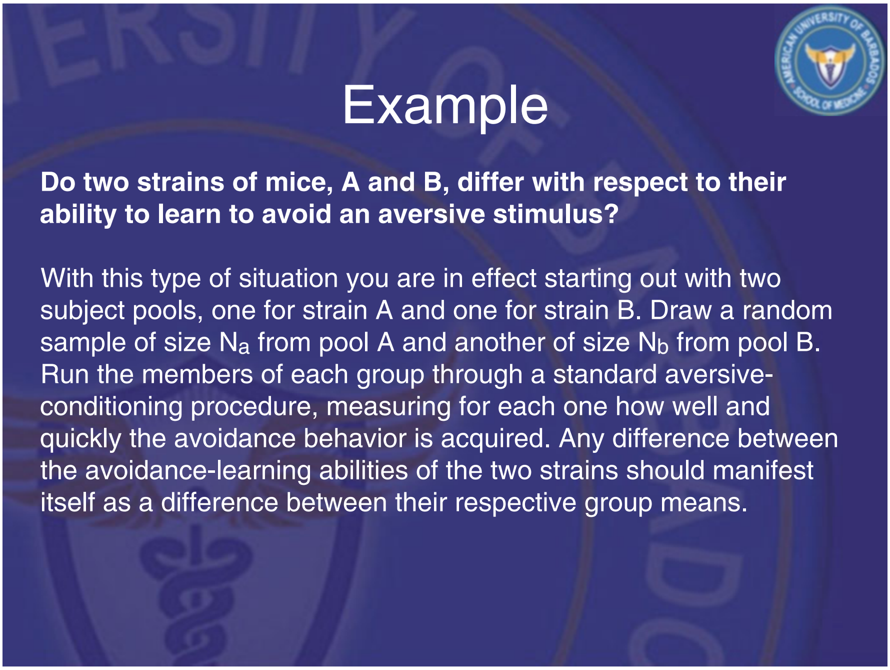

Stata
• **General Use.** Stata is a package that many beginners and power users like because it is both easy to learn and yet very powerful.
• **Data Management.** While the data management capabilities of Stata may not be quite as extensive as those of SAS, Stata has numerous powerful yet very simple data management commands that allows you to perform complex manipulations of your data with ease. However, Stata primarily works with one data file at a time so tasks that involve working with multiple files at once can be cumbersome.
• **Statistical Analysis.** Stata performs most general statistical. The greatest strengths of Stata are probably in regression (it has very easy to use regression diagnostic tools), logistic regression. Stata also has a very nice array of robust methods that are very easy to use, including robust regression, regression with robust standard errors, and many other estimation commands include robust standard errors as well. Stata also excels in the area of survey data.

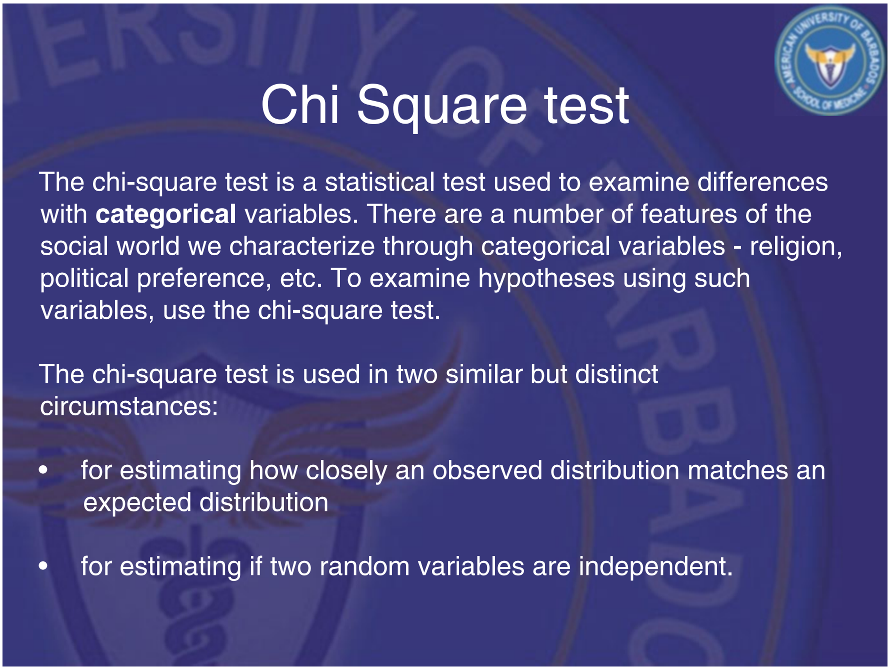

Overall Summary
Each package offers its own unique strengths and weaknesses. As a whole, SAS, Stata and SPSS form a set of tools that can be used for a wide variety of statistical analyses. For example, if you were performing analyses using mixed models you might choose SAS, but if you were doing logistic regression you might choose Stata, and if you were doing analysis of variance you might choose SPSS. If you are frequently performing statistical analyses, we would strongly urge you to consider making each one of these packages part of your toolkit for data analysis.

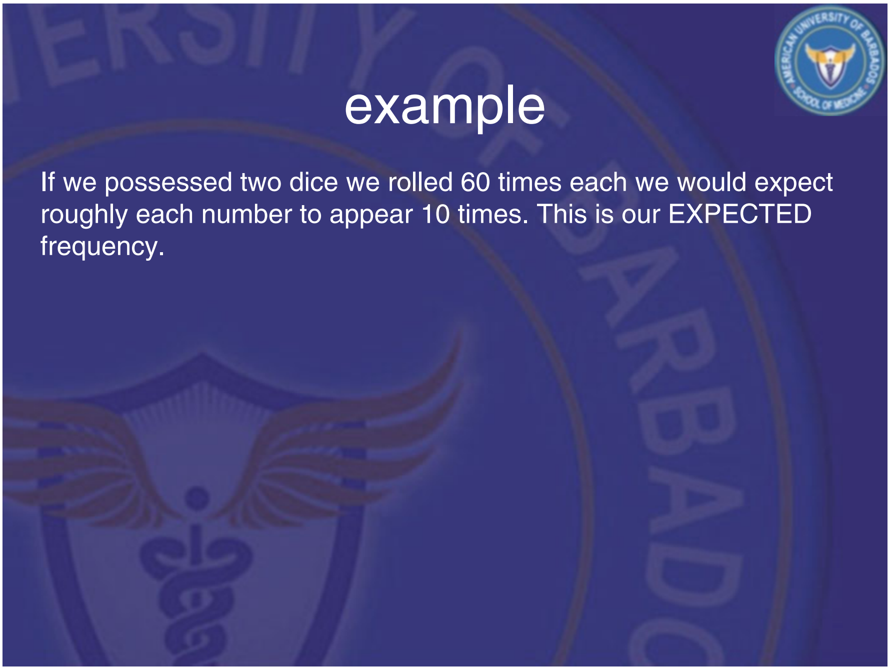

One Sample T-Test
The one-sample ***t***-test is used when we want to know whether our sample comes from a particular population but we do not have full population information available to us. For instance, we may want to know if a particular sample of college students is similar to or different from college students in general. The one-sample t-test is used only for tests of the sample mean. Thus, our hypothesis tests whether the average of our sample (**M**) suggests that our students come from a population with a know mean (**m**) or whether it comes from a different population.

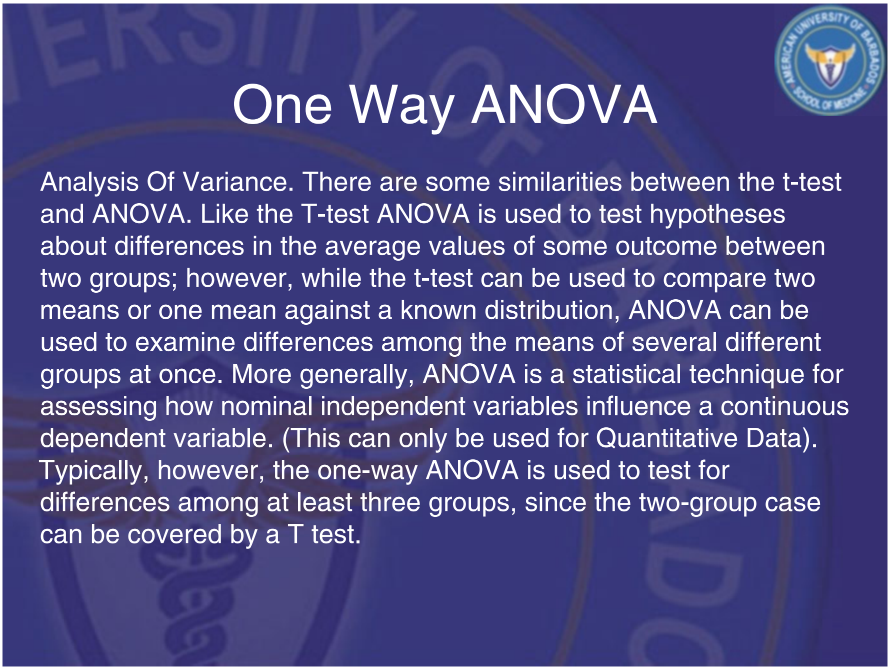

Two-Sample T-Test
We often want to know whether the means of two populations on some outcome differ. For example, there are many questions in which we want to compare two categories of some categorical variable (e.g., compare males and females) or two populations receiving different treatments in context of an experiment. The two-sample t-test is a hypothesis test for answering questions about the mean where the data are collected from two random samples of independent observations, each from an underlying normal distribution.

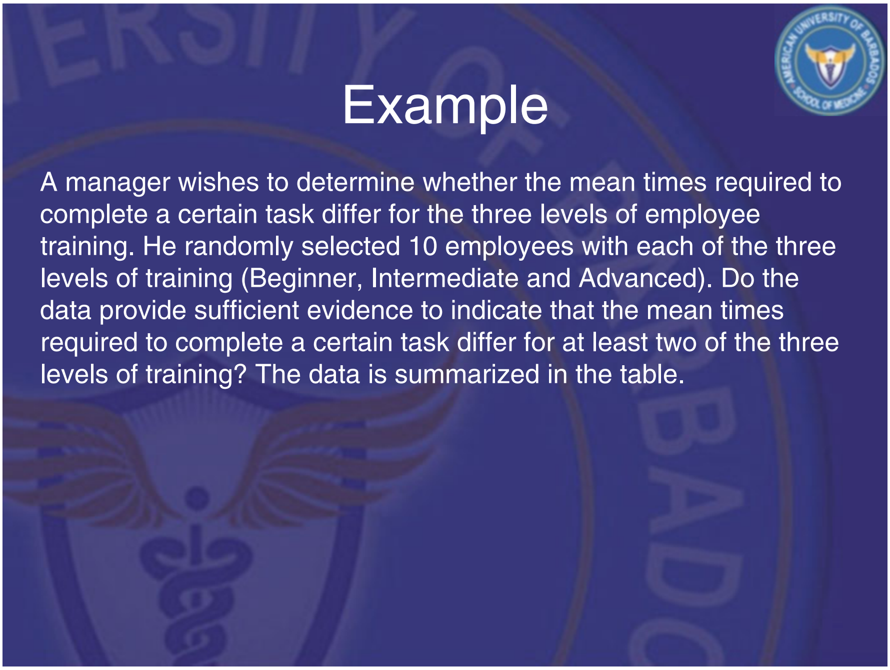

Example
A random sample of 36 AUB Students have a grade point average of 5.0 in math with a standard deviation of 0.452, whereas marks range from 1 (worst) to 6 (excellent). The grade point average (GPA) of all College Students of the last five years is 4.7. Is the GPA of the 36 pupils different from the populations' GPA?

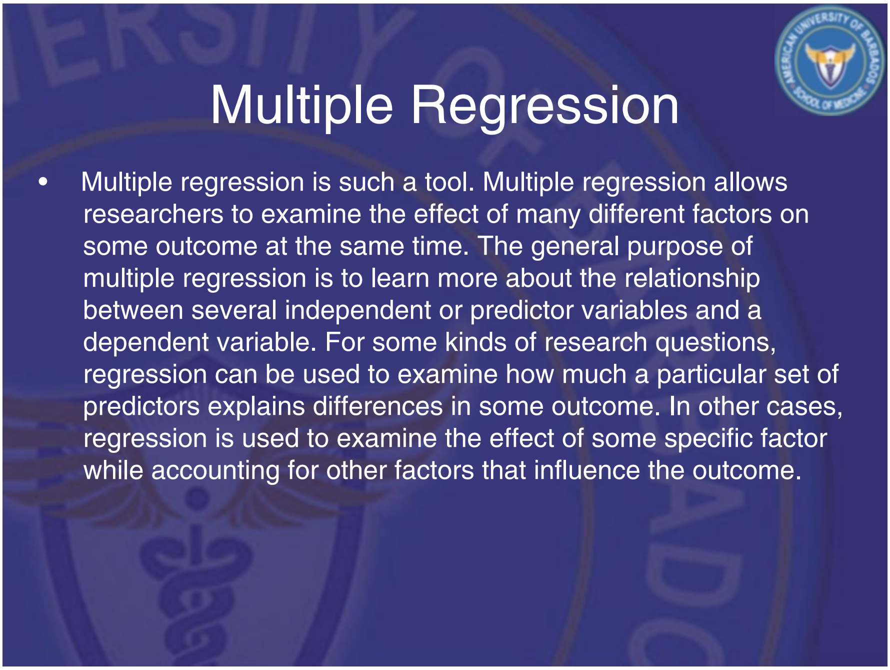

Example
Do two strains of mice, A and B, differ with respect to their ability to learn to avoid an aversive stimulus?
With this type of situation you are in effect starting out with two subject pools, one for strain A and one for strain B. Draw a random sample of size N_a from pool A and another of size N_b from pool B. Run the members of each group through a standard aversive-conditioning procedure, measuring for each one how well and quickly the avoidance behavior is acquired. Any difference between the avoidance-learning abilities of the two strains should manifest itself as a difference between their respective group means.

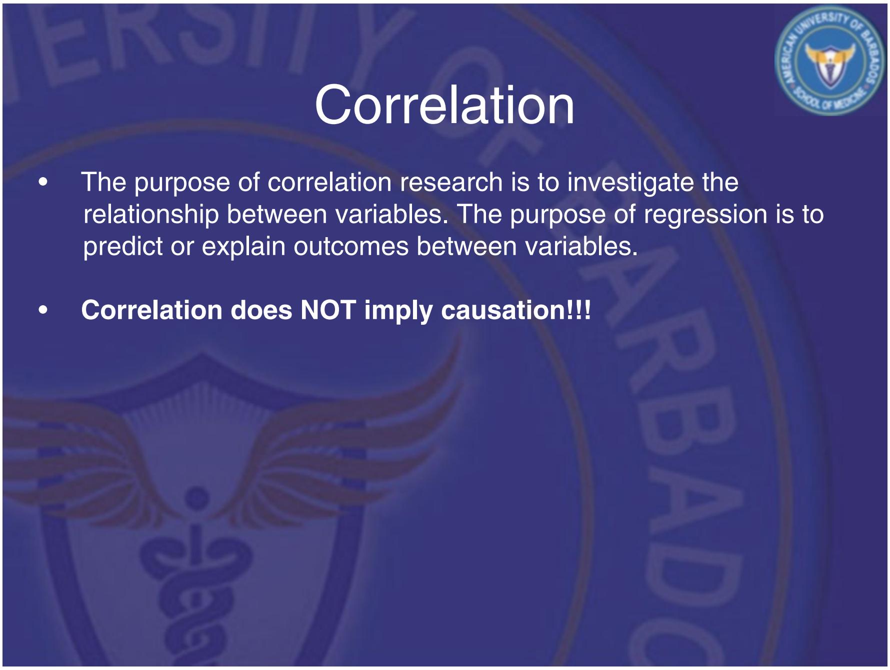

Chi Square test
The chi-square test is a statistical test used to examine differences with categorical variables. There are a number of features of the social world we characterize through categorical variables - religion, political preference, etc. To examine hypotheses using such variables, use the chi-square test.
The chi-square test is used in two similar but distinct circumstances:
• for estimating how closely an observed distribution matches an expected distribution
• for estimating if two random variables are independent.


example
If we possessed two dice we rolled 60 times each we would expect roughly each number to appear 10 times. This is our EXPECTED frequency.


One Way ANOVA
Analysis Of Variance. There are some similarities between the t-test and ANOVA. Like the T-test ANOVA is used to test hypotheses about differences in the average values of some outcome between two groups; however, while the t-test can be used to compare two means or one mean against a known distribution, ANOVA can be used to examine differences among the means of several different groups at once. More generally, ANOVA is a statistical technique for assessing how nominal independent variables influence a continuous dependent variable. (This can only be used for Quantitative Data). Typically, however, the one-way ANOVA is used to test for differences among at least three groups, since the two-group case can be covered by a T test.


Example
A manager wishes to determine whether the mean times required to complete a certain task differ for the three levels of employee training. He randomly selected 10 employees with each of the three levels of training (Beginner, Intermediate and Advanced). Do the data provide sufficient evidence to indicate that the mean times required to complete a certain task differ for at least two of the three levels of training? The data is summarized in the table.


Multiple Regression
• Multiple regression is such a tool. Multiple regression allows researchers to examine the effect of many different factors on some outcome at the same time. The general purpose of multiple regression is to learn more about the relationship between several independent or predictor variables and a dependent variable. For some kinds of research questions, regression can be used to examine how much a particular set of predictors explains differences in some outcome. In other cases, regression is used to examine the effect of some specific factor while accounting for other factors that influence the outcome.



6.3 Medical Writing

The Japanese saying, 'publish or perish' is so challenging, almost akin to naming and shaming, that most physicians and scientists prefer to follow it verbatim. They would publish rather than perish.

Documentation has always been a regular practice of all forms of physicians and healers. In the old days they used to document each experiment and each clinical observation with extreme care, caution and precision. Antiquated clay and lead tablets from Babylon and the pharaonic era are available in the museums, showing the healer, be it a priest or a court physician, dictating notes. It was often documented by the disciple or the pupil as the master dictated his observations. Or, if the physician thought it imperative to write down each observation himself, he would burn the midnight oil, jotting down each item, carefully and precisely.

In the Hunterian museum in London, as indeed in many museums across the Middle East, one often encounters a picture of Al-Farbi or Avicenna examining a patient and noting down the features.

In later years of the middle centuries, after the ages of clay tablets and papyrus were gone and paper had been discovered by the Chinese, documentation on this new and relatively inexpensive substance became the norm. The earlier materials including clay tablets had relatively short lives in terms of maintaining quality over a period of time. and papyrus did not last long anyway because of biological decay.

So when paper was freely available, writers adopted it as their main medium of documentation. This happened in the eighth century AD.

For a modern physician, it is absolutely vital that he writes and preserves important matters for posterity. The libraries and the learning centres are the greatest source of information and a real means of joy for an avid reader.

This century is rightly called the century of information technology. Pundits claim that the age of the written paper books is over, as electronic media have all but replaced them. Only time will tell, but one cannot deny the fact that the pleasure of reading a paper book is simply irreplaceable with anything electronic. The latest evidence of a library loaded with books was unveiled on the 3 September 2013, by Malala Yousefzai, in Birmingham. It is the largest library in Europe, spread over several floors of bookcases lined with the priceless treasures. The cynics may want to visit it to see the glory of a library filled with books.

In any case, the concepts of storage of data electronically, e-learning and e-books have revolutionised the game of writing, forever. Technology should not be ridiculed nor met with resistance, as it usually succeeds!

Medical writing is required for various reasons. A medical student must acquire the habit of medical writing as early as possible. With time, one can hone it, master it and excel in it.

Some people write because they have a built-in desire to write, document, share and disseminate their knowledge and experience. They are genuine people and are somehow forced by their nature to write. It is not necessary that what they write will always be state-of-the-art material or something to preserve for posterity. However, because they are genuine in their approach, their writings are good if not extremely good. Since they have the capacity to express themselves through their writings, they tend not to present the material to a serious reader if they find it to be less than optimum.

Ghalib, the illustrious philosopher-poet of the East, preserved only 2,100 couplets in his life, which were documented and survive to this day! He was a prolific writer and had certainly written volumes, but he himself destroyed the subject matter he considered sub-standard.

Then there are people who write for financial reasons, such as journalists and media people. Since they are compelled to write for their livelihood, they just write without much thought about the quality of the write-up. This category does not include those masters who write for their livelihood, but write with passion, producing such masterpieces as War and Peace or Brothers Karamazov, just to mention a couple. After all, who cannot but pay all due respect to masters such as Shakespeare, Milton, Wordsworth, Shelley, Dickens, Victor Hugo and a whole lot more.

In the medical profession there are many who write for career advancement. It is usually expected that each physician would produce x number of papers duly published in indexed, peer reviewed journals to get a certain job. It is a universal requirement and global practice. Such writers are seasonal and do not last long. Once the task is done they simply discard the writing pen and never write again. It is a sad albeit common phenomenon.

Writing must be an integral part of medical education. After all, it is all about communication skills these days, isn't it? What better way to communicate effectively with peers or patients than through writing? While a conventional curriculum is routinely taught in the medical schools, those that excel pay special attention to ancillary courses. One of them is medical writing.

The most influential and very basic form of medical writing is an original article. It can be authored by one or many. However, all must have contributed scientifically to the article to justify their honest inclusion; however there are many other formats.

The common forms of medical writing are:

Original research paper
Review article
Case report
Short report/communication
Special communication
Quiz/case-based discussion
Conference reports/reportage
Proceedings
Abstracts
Letters to the editor
Editorial
Poster
Dissertation
Thesis
Monograph
Book

6.3.1 Original Research Paper

An original research paper must possess certain attributes. The most fundamental question on which rests the building structure of an original paper is the question or the topic with which the research is concerned. The researcher should be absolutely clear about the question raised, investigated, searched, analysed and concluded.

What criteria would be required to be met to make a research question worth perusing?
Experts have identified it as follows: it is called the FINER criteria:

F Feasible
I Interesting
N Novel
E Ethical
R Relevant

(Trish Groves: Deputy editor, BMJ)

The hypothesis on which a particular piece of research is based must be original, innovative and precise. The writer or the research scientist is responsible for identifying a hypothesis, generating data and conducting the research.

It is vital that a statistician is involved in research at the outset. The role of a statistician cannot be over-emphasised. It is the job of a statistician to advise the researcher on the type of study, its design, its validity, specificity, sensitivity and sample size. As the study progresses the statistician advises the researcher on the adequacy or otherwise of a given study. Later on, once the study reaches its final stages, it is the statistician who concludes the significance of the study, employing the most suitable tools of statistical analysis and appropriate software.

Various types of research studies are available to a researcher. It is essential that the type of study is identified and categorised right at the beginning. Only a properly designed study can meet the criteria set by peer reviewed journals. A faulty study will neither give satisfactory outcomes nor gain entry into the annals of documentation. A young medic may find it hard to succeed in his study without the guidance of a supervisor.

The choice of a supervisor is important. Be careful as a lazy or overworked supervisor may delay your research, let alone its publication. Have a thorough look at the track record of a supervisor. If he has successfully supervised a few students in the past, then you may have a good chance too. If not, beware or you may regret it.

Then there is the question of ethics. No research can be carried out without approval by an ethics committee. This subject will be discussed later under the heading of research methodology. Suffice it to say that documentation of a research paper must be ethical, which is simply achieved by the researcher acting ethically. It is vital that negative results are also documented just as honestly as the desirable positive results.

The researcher must also remain unbiased during the whole process as a bias of any kind, either supporting or rejecting the null hypothesis, must be avoided. Bias is an extremely damaging attribute for any research, hence its write-up in the form of an original article. In these days of EBM, much emphasis is put upon the role of bias. It is essential that a medical writer bears the element of bias in mind while documenting his work. It is rightly said that a scientific mind should be neutral and unbiased.

It is advised that the research group should decide upon the principal investigator, co-investigator and associates. The main person conducting the fundamental research should be the primary, i.e. the first writer in a scientific paper. Accordingly, other partners involved in the research should appear as co-authors. Any other person involved in research, documented as an original paper, should be duly acknowledged according to the contribution. It is unethical that a head of an institution, who may not have contributed at all, should add his name to the list of authors simply by virtue of his official position. Likewise, the main writer, even though a junior, should have the courage to deny such an authoritative addition if it is suggested.

Research is only good if it is conducted ethically, particularly when involving human subjects. The infamous human experimentation in the Nazi era led to the development of the Helsinki declaration by WMA. Since its promulgation in 1964 it has been revised periodically. The last version came out in 2010. The details are available on the net.

Confidentiality of the patients or human volunteers must be maintained at all costs in an article. Anonymising the data is compulsory and no person may be exposed or his identity established through a name, date of birth, gender or address.

No photograph may be published without the relevant person's informed consent, and the photos should be duly anonymised. Guidelines for ethical publications are available for any serious writer, and must be strictly observed.

Informed consent is the backbone of autonomy. No research is possible without informed consent. Due literature on this subject is available for any researcher and writer. Autonomy employing informed consent is the standard modality in the West. In many Eastern cultures, however, informed consent is often not individualistic but surrogate, and this is accepted by many researchers, with a few caveats. It is recommended by ethics committees that, despite surrogacy, it is best to obtain individual informed consent, particularly if developing nations are involved, where tribal and cultural bonds can allow the transfer of rights to the chiefs, who may not always be ethical, or mindful of the possible consequences of research.

Animal experimentation is allowed based upon the ethical principle of utilitarianism. It is, however, important to remember that due compassion and kindness should be shown to the animals employed in research.

Groups of animal lovers often protest and raise their voices against the use of animals, calling for direct action against the laboratories, as happened in Oxford a few years ago. Therefore, secrecy in such matters and assurance to animals' rights activists that due compassion to the animals is observed by the scientists may be helpful.

Science cannot progress without research. It is of paramount importance that the rules laid down in the guidelines called the Good Medical Practice (GMP) must remain in the forefront of any clinical trials to be published in a peer reviewed journal.

While Phase I and II trials of a new molecule are carried out in animal models, human experimentation is then required in Phases III and IV of a new drug to ensure efficacy and safety before large scale consumption. Any research paper must identify these trials and duly acknowledge the role of such volunteers, who often do so at some possible risk to their lives. A few years ago, a clinical trial in a London hospital went wrong, creating major ripples in the national news media. A couple of those paid volunteers almost died as the drug under trial caused massive damage to their immune systems.

This is why it is the duty of the research group to explain each and every conceivable consequence to the participants. Likewise, the participants should be made fully aware of the financial and monetary benefit and rewards. As discussed before, distributive justice demands that the benefits of the clinical or therapeutic trials must be freely and equally available to the participants as to those who pay for the cost over many long years of the new drug, holding patent rights. The researcher must also include the risks and benefits to society at large and should mention this in the paper.

Since writing an original article requires guidance either from a senior or peer, the International Committee of Medical Editors has published their guidelines on the web page http://www.icmje.org/. It is of extreme benefit to both novice and master, as no one should call himself a perfect writer lest his decline may ensue!. It describes uniform principles for submitting an article to a biomedical journal.

It does not guarantee its publication but should make it more likely to be accepted than rejected. Another useful source of guidelines for manuscripts is available on http://www.equator-network.org.

Manuscript should follow certain basic principles of writing. It should be clearly written, with short sentences, employing simple and frequently used words. Brevity is beauty. Long and confusing sentences reflect chaos in the writer's mind. Clarity of thought is best displayed in brief, precise and meaningful sentences. A good writer avoids jargon and acronyms, which may mean different things to different people.

The writer should be specific in explaining the purpose, aims and objectives of the article. One must be concrete and not vain, abstract or a doubting Thomas. It is essential that the writer says what he means and actually mean what he writes. This grants due credibility and credence to a write-up, making it different from thousands written purposelessly.

The editor's job is not easy. Indexed journals with high impact factors receive a vast number of papers. They face many a dilemma on a regular basis. There are many reasons for rejection.

Many lack text and fall short in diction. Others may be rejected because of the language involving lots of jargon or flowery words. Some may lack precision, direction, presentation and substance.

An extremely common reason for the rejection of papers by quality journals is a fault in the research technique on which the foundation of the paper is based. If the technique is faulty then the outcome has to be deficient in many ways. Many young writers fail to be published because of their over-enthusiasm, self-promotion, self-praise, or simply being selfcentred, thus losing the plot altogether.

Rationality is the foundation stone of good research and hence a good scientific paper. One common cause of rejection of a manuscript by editors is the lack of rationality in the write-up. Confusion of mind leads to chaos and lack of rationality. It must be avoided at all costs. An example of confusion and chaos in the writers mind is displayed in the contradictory statements he may make in his write-up. It shows up like a sore thumb, and is self-defeating, damaging and highly frustrating for the editor or the reviewer. Likewise, repetition of facts in a paragraph or a whole article is akin to insulting the intelligence of the reader, let alone the editor. It must be avoided in a quality write-up. Once a statement is made with precision and conclusion, the message should have been conveyed. Repeating oneself means waste of the resources, time and effort. In one word, it is self-defeating.

One major reason for the rejection of a manuscript is the omission of the essential data from the text or tables. If something has been described in the text, it need not be repeated in the tables, graphs, charts, etc., and vice versa. Once again, it is a waste of resources, as composing, printing, and publishing are all expensive activities.

One must remember that no article can be satisfactorily written without thorough research into other relevant works. To ignore an important work either through natural oversight or outright bias is an unpardonable crime. If an editor detects such an act as a deliberate effort he may not just reject the paper but make a note in his little black book about an author who is biased and myopic, lacking the moral strength to compliment a colleague, a peer or a senior who may have followed the same path earlier!

Then there is the very basic question of writing skills. Science per se is a dry subject. Unlike art and fiction, it may indeed lack lustre and glitter. So to make it readable one should try to make the subject interesting and not boring. Humour in medicine is fun. Without making an article fictional or fictitious, one can make a decent paper on a dry subject quite interesting to read.

Let us now turn our attention to the subject of authorship.

A genuine author bases his paper on his personal work, which manifests itself in the way he expresses himself. A guest writer or a ghost writer may become obvious to the seasoned reader in just a few sentences. So, if you are a genuine researcher and want to be recognised as a genuine writer, to be taken seriously, cited and quoted, make sure that you write it yourself and to not ask someone in the neighbourhood to do it for you. Such a practice may suit someone not keen in perpetuating his skills, but he may well be just a one-time author!

In an original paper, the authorship is subservient to the contribution made in its preparation. The first step, of course, is the conception of the idea. Whoever conceives it is the first and foremost person and must be duly acknowledged as such.

Then there is the role of designing the study. It may require more than a novice to design a scientifically sound study. So the person who designs the study is an author and must be duly acknowledged in the write-up.

A statistician is an advisor involved from day 1. He may not be an author, but his role in helping with the selection of the study, statistical analysis of the data and any such matter must be duly acknowledged.

Drafting an article is an art. Some are born with it; others acquire it with practice. In some extensive works, such as monographs and books, professional copy writers may be involved to give the text a certain professional flavour and texture. It is your text, albeit duly improved by a professional writer through the courtesy of the publisher, such as Springer, for example.

Before giving the final touches to an article it is advisable to show it to a senior person with writing credentials. A critique by an experienced person could save the paper from rejection by the editors. Generally speaking, it is recommended that once an article is written, it is left for a while to 'mature' (metaphorically speaking). When one goes back to it, one may find many faults needing editing or deleting, as well as additions or substitutions. It is a good policy to review your writing critically and objectively after a lapse of time to improve upon it, thus gaining a greater chance of approval by the editors.

Once the process of writing the draft and ritually analysing is finally over, a final version may be circulated amongst the co-writers before submission for publication. Of course one has to add a disclaimer, or state a financial interest, if any, in the research or the products employed.

Each author must sign the paper and the lead author should declare his responsibility for the correctness of the published material. Technically this is called the guarantorship. An address should be duly recorded at the end of the paper for a reader to contact, raise queries, discuss, comment, criticise or declare approval.

Authorship of an article is an important element. It should therefore be taken seriously. The original researcher is the person who has the right of ownership of the article, which he should jealously guard against fraudulent or sycophantic sharing. A person who may have collected the funds or data may be acknowledged, but may not be endorsed as an author. Any person who does not meet the criteria mentioned above should be excluded from the authorship. Multiple authors simply dilute the credit of ownership of the writer. Besides, once again, applying the principle of equity and justice, the reward should be given to those who have actually contributed.

Ideally, each person's contribution to the research and writing should be specified such as: MS conceived the idea, PK designed the study, FJ procured funding and so on. This practice is being encouraged by most highly indexed journals to avoid conflicts over the long-term authorship of a lengthy work, when, for example, someone may have contributed only briefly at the beginning.

Honesty in medical journalism is the key to success. Avoid any conflict of interests and declare it beforehand to save unwanted embarrassment at a later date. Sooner or later it will be discovered, which may cost you very dearly. So avoid at all costs.

One thing that ethical medical journalism simply abhors is *misconduct* in writing. This includes many items discussed here.

Fabrication of data is a crime that can never be forgiven. There have been very highly respected scientists who were found to have fabricated data, causing them much embarrassment in their later lives. Likewise, falsifying data, by adding or subtracting items which are relevant or otherwise, to make the paper look more authentic and outstanding is an extremely unethical practice and must be condemned. Adding or discarding data, equipment, material or method as a means of artificially inflating the paper is also looked on as falsification and must be avoided.

However, the worst crime in medical writing is plagiarism. This basically means that another person's ideas, concepts, thoughts, works, research, write-up, words and sentences are employed in your own name without acknowledging the true owners' contribution or giving them due credit. Publishers have now acquired software which can detect plagiarism without much difficulty and will then discard the work, bringing discredit to you. It must be avoided like the plague.

No doubt the same thoughts can crop up in several people's minds at a given time. They can also conduct research on similar lines, but, despite all such similarities, the final outcome in the form of documentation has to be different. If it turns out to be identical, then it would have defeated the law of probabilities.

An original paper is designed to cover certain elements, which are briefly described here.

6.3.1.1 Introduction

This basically answers the fundamental question as to why have you chosen the subject for research and documentation. So it involves a brief but precise definition and a description of your null hypothesis, mentioning the reasons for choosing it. During the process of delineating the reasons, a write-up should mention the relevant work of others on the same theme and topic. Relevant authentic references must be quoted, and an introductory line or two of the work done should be mentioned. It is the job of the writer to identify gaps in previous works of similar nature which you hope will be filled by your research and documentation. In this paragraph you should also give the reader a glimpse of what is to follow in terms of materials and methods, together with the statistical analysis you propose to employ.

6.3.1.2 Material and Methods

In this paragraph the writer should describe at reasonable length the materials such as laboratory equipment, animal models, etc. and use the word subjects or patients if they are used, because they are not material but human beings. They must be addressed suitably. The process of inclusion and exclusion criteria, or why a particular strategy or model was chosen or given preference over others should be mentioned in clear, precise words. This should then be followed up by the methodology, technique, process and experiments employed in conducting the research. Definite reasons for choosing your method and supporting evidence as to its suitability for your research must be duly emphasised. This part of your research document is in fact the very soul of the project. So be precise, clear and meticulous in writing this part of the paper. It should be authentic, genuine and thorough, making it look like what it should be, i.e. scientific and trustworthy.

6.3.1.3 Results

The paper revolves around this component of your research. Your results will prove or disprove your null hypothesis. Either way, the results constitute the very basic reason why it should be published. It is not correct to think that if your results negate the original thought, you may fail to impress the reader. In fact many top class theses are based upon negative results. It is said by some savants that if you prove your hypothesis through affirmative results, it becomes a thesis, if not then it is called an antithesis, which is sometimes more valuable, as stated earlier. So due emphasis should be laid upon writing the results. Statistical analysis is part and parcel of any research, and the results of a research paper are incomplete with due statistical support. It is necessary to describe the statistical tools employed in arriving at the conclusions, and to augment the findings. Tables, pie charts, and other forms of graphics do not just supplement the results but also beautify them. It is, however, unfair to use writing space for describing the results displayed in the tables and charts. Instead, reference should be made to the relevant chart or graph, drawing your conclusion in a few words.

6.3.1.4 Discussion

The literature review is the backbone of any research paper. The discussion is based upon the search of the literature carried out during the research. It must, however, be mentioned that the discussion in your paper should concentrate upon the research that you have carried out, harnessing the appropriate data and references wherever needed. Digression in discussion kills the whole exercise. Therefore, while writing the component of discussion, concentrate upon the null hypothesis, your choice of material and methods, and statistical analysis of your results, arriving at a final focal point. A precise, well-structured paragraph of discussion can outshine your research paper and make it a matter of joy for others to read. Do not, repeat do not, make statements about other peoples' work, except for pointing out any gaps or shortcomings that your study has helped to fill or remedy. It is in bad taste to ridicule the work of a colleague, but it is positive to learn from his mistakes so as to benefit mankind, which was also the objective of the other party.

6.3.1.5 References and Bibliography

No scientific work is complete without authentic references. This is such an important item in writing a paper that we have discussed it at some length in the review article. Modern facilities have made the job of referencing so much simpler. Every library has huge database available for searching. Endnote is very popular with some, as it makes the collection and organisation of data literally child's play. There are many other resources available for similar jobs.

There are several ways of referencing in a research paper. The common ones are Vancouver and Harvard. However, a writer is best advised to read the instructions for authors in a given journal and follow them verbatim. Each journal has its own policy and there is no universal way.

Since printing is expensive, it is advisable to use the most contemporary references, and usually not more than 10–12 in an original paper. The standard format is as given below.

Author's name or names, Title of the publication, the name of the journal, publishers name, year of publication, and the first and the last page numbers of the referenced article.

If there are more than four authors, one may be allowed to write "et al." after the last authors' name and initials.

Always cross check your references for overlapping content, publications, post publications and repeat or wrong referencing. There are specialist search engines such as iThenticate which uses text fingerprinting and string matching. More than nine billion articles can be searched through the CrossRef database.

6.3.1.6 Abstract

It is best written at the culmination of the write-up, though it appears at the beginning of the paper. An abstract has to be targeted, precise, and word efficient. It should cover all there is to say about the entire paper. So it is not easy to write a perfect abstract. Many journals are happy to publish just an abstract because it serves the purpose in those few lines and conveys the message to the audience effectively, efficiently and purposefully. The abstract should highlight the title, the purpose, the methodology, the results and the outcome of your study in a paragraph. A busy clinician has no time to read your four or five pages of paper, but he can certainly gain enough information through your abstract in one paragraph. Then, if it attracts his fancy, he may read the whole article at leisure, and recommend others to do so. However, it all depends on how good a wordsmith you are. As a serious scientific writer, writing an abstract is the key to success

6.3.1.7 Keywords

Each paper must possess a keyword or several keywords. The search engines just need a keyword or several keywords to locate the desired publication by a search through the plethora of available literature. Therefore if you wish other people to read you and cite you, you must choose your keywords, in the same way a diamond jeweller chooses his pieces for a necklace. Be sharp, clever, intuitive, inviting and exciting in the choice of keywords. It is like placing a flower box on a window sill to attract the butterflies. Just one can spread the pollen generated by your flower box to hundreds of plants!

An original paper is in fact the most important piece of scientific writing which every scientist writes at some time in his life. Some succeed in producing a masterpiece; others just write, publish it if lucky and are duly forgotten.

This does not mean one should not spend time and effort in writing an original article. On the contrary, one must write more and more original papers, so that eventually a masterpiece can be produced. That ageless saying is so apt: 'If at first you don't succeed, try, try and try again'.

The good old exercise in schools where one had to write a precis comes in handy in writing original papers. Constant and repeated exercise at writing about many subjects, more as an exercise than to produce a piece to publish, is what a medical student should continue to do in his medical school days.

With the passage of time, his concept will become clearer and his writing skills will shine.

The whole objective of writing a paper is to publish it. So here are a few tips to please the editors and the reviewers.

First and foremost, please make sure that your message is heard and read loud and clear, not just in your introductory letter requesting it be published, but also in your abstract. A busy editor may just read your abstract and no more. So if your message attracts his attention, you may be invited to proceed. If not, then you may simply get a note of rejection.

You must also send extra material with your manuscript such as a CONSORT checklist and details of any relevant paper, whether original or a review, which you think might support your write-up and attract the attention of the editor and the reviewers. Such published reports add to your rights to publish if they are competitive and informative in nature. Since they have been published elsewhere, you may find yours published too. These published reviews or papers support your write-up in many ways, almost carving out a niche for you.

If you have duly impressed the editor and he asks you for further information, clarification or any supportive document, be prompt, precise and clear. You may be lucky this time round.

If your paper is rejected, do not despair. Even the master artists had to struggle at the beginning to impress the galleries to display their works. Keep trying – eventually you will succeed.

6.3.2 Review Article

This is the second common type of publication journals like to consider. A review article is often but not always written by invitation. So the editors normally request a senior person to write a review article on a given topic. It is usually a senior faculty member, a seasoned clinician, someone with a special interest in a particular subject or an authority, a person with huge knowledge and experience or someone renowned for his reading habits, a wise person known to be able to analyse data objectively, critically and professionally.

A review article is based upon considerable personal experience and a whole lot of background information, extensive literature searches, critique, analysis and specific conclusions drawn by the author after giving considerable thought to the exercise.

A review article is written with the sole objective of reviewing the relevant previously published literature with a view to putting it in some kind of perspective, offering critical evaluation and drawing certain conclusions which may benefit the reader.

There is a famous saying about reviewers. It says:

> Nature fits all her children with something to do.....
> He who would write and can't write, can surely review (James Russell Lowell).

Its format is different to the original article. As mentioned before, the original article follows a pattern best described in the following mnemonic:

I Introduction
M Material and methods
R Results
A Analysis (statistical)
D Discussion

Conventionally a review article has the following format:

Introduction
Details and description of data
Literature review
Discussion
Conclusion
Summary
Bibliography

There are various formats of a review article or publication. It will depend upon the requirements of a journal as to what form of a review they want. They might simply ask for a critical evaluation of the relevant literature, which really may be exhaustive and time consuming. They may request a review on the bibliographic completeness of a given topic or subject. It may be equally exhaustive, though less so with the advent of modern facilities such as Endnote, etc.

Then there are yearbooks, an extremely popular form which can be seen in the shape of the illustrious series of 'The Clinics of North America'. They are really, really comprehensive on a given topic, often written by invitation by an authority on the subject. For any academic institution or library, these yearbooks are simply indispensable. So much information is given in these action-packed slim volumes that the reader might save himself the labour of reading thousands of pages by just going through maybe 200 pages of a yearbook.

Another type of review publications is called a chronological sequence. It is often written as a series of publications on a specific topic. For instance, one may publish a sequence of publications on ethics, which may accumulate over time and then be compiled as a book for future reference and subsequent use.

State of the art reviews are highly acclaimed publications written on a selective subject by a real master. For instance on Shakespeare's sonnets, his comedies or his tragedies, or the war speeches by Churchill or the famous paintings by masters such as da Vinci or Rembrandt or Van Gogh. For obvious reasons such masterly works are uncommon, highly selective and designed for specific purposes.

Coming back to review articles for medical students or physicians, it may be said that an outline may be drawn before beginning a review article. It may be a rough sketch in your mind, more like a road map, as to what you wish to convey through your writing. Some people prefer to write long paragraphs without subheadings, others like to break the monotony by inserting subheadings. Both are acceptable, but subheadings make the article more readable.

At the outset, you must gather a large amount of published material to harness in your writing. It may involve extensive reading, making notes and highlighting those items you may wish to use. The larger the literature search the more authentic the review. It can be a tiring but extremely rewarding exercise.

Impact factor
Is a numerical method of comparing the value and impact of a journal on a community in health matters, with other journals

In its introduction, a review article needs much deliberation, thought, planning, and a huge amount of information on the topic, inserting relevant references when and wherever needed. The introduction is actually the face of a review article. It must be expressive, expansive and informative. Since the subject needs to be clarified for the reader, all the relevant information on the reasons – why, what, and how – should be incorporated into the introductory paragraphs. Although in the original article it had to be exclusive and selective, in a review article an introduction should be exhaustive and detailed.

In an original article, the main body of the paper is the material and methods. In a review article it is the introduction and discussion, which form the main component of the write-up. Therefore the discussion must be elaborate, detailed and duly referenced. A good review article may have a large number of references, which add to the weight of it. However, one may not quote old and downtrodden references in an innovative work. That does not mean one should ignore time-honoured references in favour of new but untested citations. A balance has to be drawn in the discussion, describing or discussing a certain point in the paper duly supplemented by an appropriate reference. Many top-of-the-range reviews may have only half a page of text, the rest being covered by the references, making the publication weighty and influential.

The conclusion is an important part of a review article. It duly highlights the salient component of your work and the final message you wish to convey to the reader. It should also highlight future trends, giving guidance to the reader to look for those areas which need further exploring. An essential component of the conclusion is to emphasise the gaps and shortfalls in the research so far by identifying them and advising the reader to look for answers through further research with a view to resolving the controversies. It is not easy, as wise men seldom agree on a point, but one must do one's best to help remove deficiencies and conflicts through a message in the concluding paragraphs.

The summary is the final section of a review article, though it is posted at the beginning. It is slightly different to an abstract written in an original article. A summary is usually written as a single continuous paragraph, giving insight into the subject discussed and the outcome of the review, advising the reader to follow on in areas which the present article may not have covered. It is always good to lead the next writer, as nobody can say with authority that he may have broken the pen on a given subject. Knowledge is fathomless, and when you think you may have invented the wheel, a literature search might surprise you by showing it had already been done some time in the past.

So summarise your review in short but meaningful sentences, duly highlighting the salient features of your contribution.

References should follow the instructions given in the column of a journal under the heading 'Instructions to Authors'. Some journals prefer the Vancouver, others the Harvard method of bibliographic notation.

Keywords are a way of getting hooked into the net or the libraries. Choose two to five keywords, which should be eye catching, and appealing to a searcher.

6.3.3 Case Report

A common way to publish in a good journal is the documentation of a local case. An unusual presentation, or unusual pathology, its clinical evaluation, diagnostic workup, management, etc., can all be reported in a journal A pathologist may publish a series of histological slides, a clinician may show a few photographs, a radiologist may want to share an unusual radiograph. It has to be something unusual and unique to be accepted. It should also a have definite learning objectives and learning domains which may attract the attention of the reader.

Its format is simple and narrative. It may not exceed half to one page of a journal and yet may have a major impact on the readers mind. Remember the saying: … "A picture is worth a thousand words".

6.3.4 Special Communication

This is another way to write a brief original paper without the typical format described elsewhere. Any subject that is interesting, challenging, inviting and stimulating can be written under this caption. It could be something of special interest to you or an unusual experience of dealing with a patient with unusual symptoms, though preferably a larger number to justify a special communication. Sometimes it may be a brief write-up in a narrative style, when it may be labelled as a *Short Communication*. The subject is described in a simple narrative style, more like a review article than an original paper, duly supported by a small number of relevant and contemporary references. The editors love these special and short communications, as they take only a little reading time and an even smaller space to deliver a powerful message.

6.3.5 Reportage, Proceedings, Etc.

Most journalists employ this format of writing to publish a report of a seminar, symposium or event. It is simple, narrative and dedicated to a particular session or event. It could be brief or extensive, depending upon the length of the event. Such reports are of extreme benefit for keeping a record for future activities. They usually become part of an archive and often help in future writings as a useful source of referencing.

Proceedings of a conference may cover a large number of pages and are often written by professional copy writers dedicated to covering a major conference or congress. Such proceedings mention the nitty gritty of the entire activity, including the abstracts of the papers presented, seminars conducted and questions and answers, raised and replied to. Most libraries would keep these proceedings in their reference section for future reference. With the modern space-saving computer and information technology, large volumes can be stored in a small space. This is a big advantage libraries simply love. It gives them a special slot in the world of libraries and makes them proud of their treasure.

6.3.6 Quiz

This is a common activity in most journals. You can publish an unusual, interesting and challenging item in any field of medicine or surgery. Pictures, photographs, slides, histology, cytology, you name it; all are welcomed by journals, particularly if the target audience is the younger medical population. Most quizzes are designed by physicians with some experience, but not necessarily so. As long as the subject is exciting and unusual, most journals would welcome it.

6.3.7 Abstract

One of the commonest formats of medical writing. It is usually written by younger physicians, who identify something, unusual or common, interesting to report. For want of a larger space in the form of an original article, they write down an abstract, duly highlighting the aims and objectives of the study, with a brief description of materials and methods employed, analysis of their results and a brief comment about the results obtained in the light of previously published data on a similar subject. An abstract is about a paragraph in length or slightly longer, but never a full article. It should have appropriate keywords so that a reader may find it and use it in his own work.

6.3.8 Dissertation and Thesis

These are both "serious stuff". The dissertation is more like an original article where a candidate presents a hypothesis, carries out research around it, employing certain methods in the laboratory or in the clinical settings, and arrives at certain conclusions. Thus the writer pens a detailed account of all the events after carrying out an extensive literature search, and supports his results with the help of published data. The role of a statistician cannot be over-emphasised as, without his guidance, the whole exercise could be worthless.

A good dissertation is full of tables, charts and graphs, saving a lot of paper space and delivering a powerful message to the reader. A fine dissertation is usually the outcome of great effort on the part of the candidate but also excellent supervision and time to time guidance of a fine supervisor.

Once the results are finalised, the discussion is recorded, which is often quite extensive. It is this part of the dissertation which is mainly the components wherein a candidate can duly impress the examiners, with his intent and purpose in doing the hard work. It is therefore essential that considerable thought and planning should go into writing this component of the dissertation. It goes without saying that no discussion can proceed without supplementing it with ample and appropriate references.

Finally, the candidate should write a conclusion. It may not be more than a couple of pages in a dissertation of roughly 70–80 A4 pages. Suffice it to say that the conclusion may be likened to the last drop in a glass of wine. It must therefore carry all the flavour and intoxication in good measure. Many dissertations are read by the examiners starting from the end and working forwards to get the first and lasting impression. So be precise, be definite and be profitable in your efforts.

A thesis is the product of a master or doctor. It is therefore the highest form of research document. It involves a lot of effort, hard work, time, dedication, integrity, honesty and precision, to compile a thesis which should result in the award of a higher degree.

The supervisor has a major role to play. It is his timely guidance and the candidate's effort which results in a document that will decorate the shelf of an academic library.

A thesis could be spread over a couple of hundred pages. It is, of course, based upon a sound effort involving massive amounts of research, based upon a hypothesis, laboratory work, collection of data, literature search, tabulation, analysis, statistical analysis of the data, pictures, photographs, tables, charts and a whole lot of supporting bibliography. At the end of the hard work, a synopsis is written which, once approved, enables the candidate to begin the real hard work of documenting each and every bit of information gathered in the last few years. So the thesis, particularly a doctorate thesis, is not meant for everybody but for those few who have the guts, grit and determination – and, above all, the desire to reach the top of Mount Everest. It is not easy, but it is the ultimate thing a person with academic interest can do. Having said that, there are some knowledge seekers who march on to postdoctoral levels.

A good thesis is like a beacon of light for all those travellers who wish to follow in the years to come.

6.3.9 Monographs and Books

These two formats of medical writing are usually reserved for experienced, seasoned and senior faculty. The monograph is the outcome of many long years of hard work, dedication and commitment.

If it is written on a particular topic by one person, it is called a monograph. If the topics are multiple and written by several authors or one topic is shared by many authors, then it is called a polygraph.

A monograph is usually written in the form of a textbook, albeit based upon personal experience of the author, so it is less generic than a textbook and more descriptive on the topic per se.

A textbook or a book on a medical subject is once again the result of long years of experience in dealing with a particular specialty. It may be written on one particular topic or multiple topics by one or many authors. Lots of literature searches, pictures, photographs, tables, charts and discussion on the relevant subjects, finally ending with a comprehensive bibliography, a table of index terms and a table of contents.

Medical writing is evolving each day. With the introduction of e-books and e-learning, innovative ways of sharing knowledge are taking a firm hold. Traditional publishers are also employing electronic media for many of their publications.

No doubt electronic printing has made things a lot easier for the avid reader. Nowadays, how many people would bother to go to a conventional library looking for the works of masters such as Plato or Aristotle; or indeed history books like the famous Decline and Fall of the Roman Empire, a masterpiece written by Edward Gibbons. Now, one can download not just these but a thousand other classics, the copyright of which has expired, and read them on a mobile gadget at leisure. No wonder we see young and old alike on a train journey busy reading e-books on their Kindles, Android devices or iPhones, etc. How wonderful indeed!

Libraries are also becoming increasingly more accessible to a reader. The majority of medical journals are now available on line. Databases are freely available to anyone, from the campus, or from home. In fact many free wi-fi services are now available in and around the universities and even in major city centres at designated hotspots. All you need is a one-time investment in a suitable gadget and you can have the world of knowledge at your finger tips. These are exciting times indeed.

It is envisaged that, by 2050, nearly everything will be transferred to electronic databases, allowing anyone and everyone to gain full benefit from ancient, medieval and modern knowledge. The more e-learning and e-education takes hold, the more the chances that the conventional indoor teaching sites, campuses and universities, may give way to open universities. Already such universities are serving a huge unconventional student body, in the UK and elsewhere. It is expected that, in the foreseeable future, many top class universities will also join the rank and file open universities, offering online courses and awarding degrees through the net.

Many fine teachers in life sciences, arts, literature, humanities, etc. have already begun offering short- and long-term courses through the net. It is only a matter of time before medicine follows suit as the principles and modalities of imparting education and skills adopt innovative modes.

Webinars and Skype are currently being employed by many universities for sharing global knowledge bases with anyone wanting to join. This is bound to increase as conventional classroom teaching is replaced by virtual teaching scenarios.

All these innovations will lead to changes in writing habits and the ways one may access published material.

6.3.10 Referencing

No medical documentation is considered worth its salt without authentic references. Life has become so easy for a modern writer in comparison with the previous generation. Electronic referencing through online database searching is the easiest and most convenient mode. Numerous search engines are available which are packed with information. To sift through this massive plethora could be a task indeed. Google is the standard search engine which we all use in all matters, even for mundane daily issues like looking for a restaurant. However, Google Scholar is an invaluable tool for studious referencing, reading articles and choosing them for referencing in a medical write-up.

Cochran is the most wonderful source of information on a multitude of published articles. It is discussed at length in the chapter on EBM. Medline is another tool for research referencing, and is commonly used by nearly all writers and researchers. Then there are others like PubMed, which is extremely popular and highly recommended.

6.3.11 PubMed

Currently the most useful and heavily loaded database routinely employed by nearly all research scientists across the world. It is a search engine which allows – usually free but sometimes on subscription by the institutions or individuals – access to all the references available on MEDLINE. In the last decade of the twentieth century, databases were relatively few and far between, such as MEDLARS or Index Medicus. However, it was in 1996 that Pubmed became available and it has since become dominant on the world medical scene.

6.4 Communication Skills

This is the age of technology. Communication is the main theme of social media. Wherever you go you find people chatting on their mobile devices, either writing or speaking. The new birds in the forest of communication such as Twitter, WhatsApp, Facebook, and LinkedIn, etc. have brought people quite close. Gone are the days when one would wait for the postman to bring news from home. Nowadays you are in perpetual touch with loved ones; sometimes a bit too much, resulting in chagrin if not outright annoyance.

Communication skills are defined in many ways. Perhaps a simpler version could be that it is a way of gathering, analysing, synthesising, processing, sharing, documenting and disseminating a piece of information which may be useful to mankind.

There are many forms of communication available to a physician, and indeed to any other person involved in the employment of communication skills, professionally or otherwise.

The most basic communication skill which every living creature possesses, but most of all mankind, is body language. A physician can hone these basic instincts to his advantage, employing a non-verbal way of communication, through body gestures and appropriate movements. Body language can be employed to transfer information, convey a message, approve or disapprove something, collect information, seek information, express emotions and do much more. In fact some master communicators say more with a single small gesture than does a poet in a sonnet or prose writer in a paragraph. Even ordinary folk can convey a message of love or affection, appreciation, or approval with a wink of an eye!

Body language can be an extremely potent way of saying things which one may not be able to say easily with words, such as bullying, domination, disapproval, dislike, hatred, jealousy, likes, approval, affection, understanding, etc.

It is a kind of body language which works perfectly if used correctly. Many great orators employ body gestures and tone of their voice to convey their message to the audience. It is also a cultural entity, as some nations use body gestures more than others. Italians, for instance, are known for their strong body gestures, while the Brits usually have bland body gestures, avoiding physical touching if possible. Arabs are over-enthusiastic, as they not only shake hands vigorously, but engulf each other to display their love!

In medicine, body gestures play a significant role in displaying one's inner feelings. If a patient is happy, his facial expression, and body movements indicates this is the case. If sad, lonely or depressed, the facial expression as well body posture, such as sitting on the chair with a slightly sideways stance, avoiding eye contact, etc. show the inner feelings clearly enough.

Sir Arthur Conan Doyle was a Scottish physician who graduated and trained in Edinburgh. Apparently he had a teacher by the name of Dr Bell who is accredited with naming the facial nerve palsy. This Dr Bell was a fine reader of human gestures and could diagnose the ailment in most of his patients by simple observations, such as attire, the way they entered his surgery, sat on the chair, faced him or avoided eye contact, rubbed their hands or glanced hither and thither during the interview, etc. The legend has it that Conan Doyle was so impressed with his teacher that when he grew up and began his practice at the corner of Wimpole Street in London, which did not flourish, he started writing fiction and portrayed his teacher by creating a detective by the name of Sherlock Holmes. Holmes is known throughout the world for his unusual detective ways, such as observation, evaluation of body gestures, assessment of body actions, interpretation of movements, etc. to pick out the criminal. Conan Doyle himself became the less informed Dr Watson in the stories.

The medical profession can benefit from acute observation and reading of the human mind and body gestures. This is why modern medical education involves actors and players in portraying real patients in virtual scenes in structured teaching.

Some of these professional actors are excellent in playing the part given. They act and behave exactly as a real patient would.

We all use body gestures in our daily lives. The most common form is a head movement, a nod or a shake, which are almost universal and represent either an affirmative or a negative reply. Head and eyes are the main portals of information, but so are hand movements or sitting or standing postures. For an observant eye, much information can be gathered from a patient without asking a question. All that is needed is a keen eye and a receptive mind!

6.4.1 Paraverbal Communication

The human being is recognised by his voice. The philosopher saint Ali Ibne Talib (sixth century AD) said 'a person is concealed beneath his tongue'.

No one can deny the role of communication through speech. Even the birds and the bees have a language. Mankind has developed the art of speech over millennia. The body gestures, growls and grins of the cave men have been modified with civilisation and man can express himself better as he grows in maturity of mind.

Ali Ibne Talib duly advised that words diminish with emergence of wisdom. So, one sees people arguing and debating about all kinds of stupid issues in public places, trains and markets. However, a wise man speaks sparingly, and speaks with depth.

Speech is the main medium of communication in all walks of life. It is of the utmost importance to a physician. It is through speech that he can communicate with his patients. Depending upon the degree of intellect, the speech can be brief and meaningful or lengthy and meaningless.

As far as speech is concerned, it is the not just the text but the way it is delivered. Good speech is a combination of several elements. The main body, of course is the substance; but equally important is the factor of voice.

So let us discuss the role and impact of voice as a tool of communication.

Voice is produced by vibration of the vocal cords. Any medical student would know the anatomy of the larynx, so we do not intend to reiterate the details here, except to emphasise the role of the vocal elements in the production and intonation of voice.

Under the brains' command, the lungs exhale the air to produce the voice by forceful vibration of the vocal cords. However, it is not that simple. Each component of the laryngeal inlet responds to the cerebral command. The approximation of the true vocal cords is complimented by inward folding of the ventricular bands and tilting of the arytenoid cartilage, depending upon the force required for projection of vocal breath. Then there are supra laryngeal organs which help in giving a particular character to an individual's voice. This is the role of the pharynx, the nasopharyngeal space, the nose and the paranasal sinuses. Each individual has a tone of voice which is so specific to him or her that no second person, not even an identical twin, may have the same quality, timbre and tone of voice.

So, all in all, voice production is a complex act not unique to mankind. All animals produce voice, but this is just the function of the larynx. It is the mind that gives the specific meaning to a certain voice, and this is the domain of mankind. Even gorillas speak and so do the birds and the bees. However, an intelligible voice is bestowed solely to mankind, and this must be treasured.

Voice experts, i.e. speech and language therapists, inform us that they look for certain characters in a voice. It is the quality of voice which is the most important element. This quality determines the speaker's personality. The quality may be good, powerful and effective or poor, weak and ineffective. The vocal fremitus and the bodily organs, particularly the size and the volumes of chest and lungs, may have a role to play. Many **a** soprano and tenor have barrel-shaped chest with huge lung volume. They can maintain an elongated note because of their lung capacity which is significantly greater than an average person. The best example one can quote is that of legends like Pavarotti or Nusrat Fateh Ali Khan. It is not a rule but a general observation, as many first class singers have ordinary physiques. Mehdi Hasan Khan was one example of the latter, but what voice he possessed!

The intensity of pitch is determined by the forceful exit of air from the bellows of the lungs and predetermined contact with the true vocal cords at certain specific spots for a certain length of time. This is why, when a patient develops unilateral recurrent laryngeal nerve palsy, he cannot maintain a pitch, though he can speak. It is for the simple reason that the paralysed vocal cord fails to move towards the opposite side but the normal cord tries to compensate for the functional loss of its opposite number. This action produces a rough voice without maintaining the quality or the tone.

The nasopharynx also plays an important role in giving a specific character to an individual's voice. The velopharyngeal space is controlled by the activity of the soft palate and the Passavant's ridge sitting in the roof of the nasopharynx. Depending on the volume of the nasopharynx, individual voices could be normal, hypo-nasal or hyper-nasal. The classic nasal twang noticed in some people is due to the space in the nasopharynx which makes the voice nasal.

Similarly one may have a voice as if he has a bolus of food in the mouth while speaking. This is usually caused by the a functional difficulty of the soft palate as in a cleft palate or a surgical deficiency in the hard or soft palate.

Rhinolalia clausa is the voice of hyponasality and rhinolalia aperta is the name given to a voice with a cleft palate.

The character of voice is dependent on many other factors. Professional singers go through many long years of vocal training to hone the art of controlling their intensity, pitch and quality. Having checked the vocal cords of the three top singers in Pakistan, this author could safely say that they certainly had an unusual appearance, as they looked thinner at the edge and longer in length between the anterior and the posterior commissures. One of them developed tiny vocal nodules, which, despite fine surgical intervention and speech therapy, changed his voice quality to a certain degree.

Facial expressions and deliberate movement of the buccinator, and other oral muscles, are often employed by professional singers and voice users to modulate their voice. The impact of body gestures, facial expressions and vocal modulation can all create dramatic effect upon the audience.

The quality and character of voice also depends upon the individual personality. Generally speaking, those with a soft demeanour have a soft voice, which can be quite attractive to the listener. Those who have rather large and bulky, rough looking persona may have a rough, harsh, gruff and even unpleasant voice. It is not a rule but an observation.

Professional voice users take extra precautions against any vocal abuse or damage. They know how to oil and lubricate the voice to keep it soft and melodious. Many have their own vocal therapists; others see a speech and language therapist from time to time. They are trained to hold their breath and to manoeuvre it to produce the voice they want. Riaz or vocal exercise is an essential tool of a professional singer. They also consume large quantities of fluids to keep the delicate cartilages and membranes soft and supple.

6.4.2 Verbal Communication

Communication by voice is the main mode of communication between men, women and children. Verbal communication is employed in interviewing patients, asking questions, raising queries, collecting data, gathering information, showing concern, breaking bad news, sharing grief, surprise, joy or exclamation.

Making notes, documenting evidence, transferring information, making jokes, laughing, weeping, crying or yelling. People from the Austrian Tyrol have a unique way of expressing their feeling through a voice called yodelling. This way of singing was seen in 'The Sound of Music', that phenomenal story of the von Trapp family.

Voice is indeed the best way to communicate. The most influential verbal communication is based upon clear understanding of the problem and a clear understanding of the theory or the principle of the subject one wishes to elaborate. Brief sentences and short phrases indicate a clear concept in the speakers' mind. If a sentence is long and complex it reflects confusion in the speaker's mind. Masters in their subjects speak with confidence, clarity, brevity and precision.

Many public speakers are gifted. They can begin a lecture without any preparation. Extempore speech is an art which may be a natural talent. It is, however, nurtured as most of us have experienced in our schools. The literary teacher would encourage us to learn the art of an extempore speech through training and practice. Some would excel, others simply give up.

A physician has to be a good communicator. People look up to him so he should be able to influence his patients with a clear, precise, and carefully worded speech during an interview. Many physicians have soft and pleasant voices which help them gain the patients' confidence. A physician, who enjoys the confidence of a patient duly reaps a rich harvest in terms of diagnosis and treatment.

Verbal communication is the most influential way of transference of knowledge and of sharing information, teaching and learning. The major difference between a good physician and teacher and average and poor physicians and teachers is that of communication. Verbal communication is the best way to communicate.

One important factor that plays a potent role in verbal communication is that of proximity of the speaker to the audience. The distance between teacher and taught and between patient and physician can determine the relationship between the two parties.

Social interaction between two or more people is best maintained at a certain well-defined distance. Too much proximity may lead to intimacy which may not last very long. Too distant and eye contact, facial expressions, body gestures, even voice control may be lost. So a safe and comfortable distance should be maintained to convey a message.

Experts in communication and public speech inform us that a close or intimate zone is less than 45 cm, which can be uncomfortable. Everyone needs breathing space. Too close means loss of privacy, which may destroy a relationship unless it is just for a few brief moments. For instance, if a patient is in grief, a physician may hold his hand, or put a comforting arm around the back, come close to speak softly in comforting tones.

The most comfortable distance for a physician to communicate with the patients is considered to be between 4 and 12 ft. An average of 3 ft is considered to be safe, effective and respectable. It enables one to interview effectively, efficiently and fruitfully. Once the history is finished, the physical examination would obviously bring the physician in close contact with the patient, which must be carried out with due dignity and respect. Verbal consent should be obtained before a physical examination and privacy of the individual must be maintained. The basic principle of ethics, namely autonomy, comprising confidentiality and privacy, must be observed by a physician.

Public speakers tend to keep a safe distance of approximately 12 ft or between 3 and 4 m. In order to be able to communicate effectively without losing the benefit of eye contact, such a distance is quite effective. In a classroom some teachers tend to move about, coming close to the students seats when emphasising a point or moving away when a sweeping statement is made. With the modern and inevitable employment of PowerPoint, etc. the distance may vary. Small group discussions have a singular advantage in maintaining a comfortable and effective distance between the tutors and the taught.

Conventional teaching is based upon person to person contact, maintaining a respectable distance without losing the advantage of paraverbal modes of communication. A powerful speaker raises and drops his voice, modulates it, changes its tone, twists it, turns it and employs it to his best advantage. An average speaker may deliver a powerful lecture in a monotone, losing the impact that it should carry. This is why a physician and particularly a teacher must cultivate the art of conversation and communication in his early career days to benefit his students and patients as well as to obtain personal satisfaction in the process.

It is said that the index finger of a surgeon is his third eye. It basically implies that he can explore certain bodily regions to reach a diagnosis. However, he must use it with informed consent, observing due privacy. In surgical exploration of a cavity like the abdomen or thorax, frequently neither an instrument nor a gadget can be used, so the finger is the best way to identify the nature of the concealed tissue or organ. Feeling an object to diagnose is a physician's basic tool. A hard mass differentiated from a soft, fluctuant pulsatile mass may help differentiate between a bony and a vascular lesion. One may therefore be cautious in using a sharp instrument, thus saving oneself from a disaster.

One of the mandatory courses for all NHS employees is Basic Life Support or BLS, which teaches the fundamental principle as 'look, listen and feel'. It means that a physician should employ the observational senses by looking at the patient for signs of life, illness, pallor, perspiration, etc., then listen to breathing, its character, its shallowness or depth, its rate or character, etc., then feel the pulse, check the heart rate, palpate the possible site of trauma, or disease, etc. So, the fundamental principle of BLS is to use all the element that a physician possesses to explore and to reach a diagnosis.

Experts inform us that visual and auditory observations are essential, but for a physician the most potent tool is that of feel or touch.

Touch or physical contact is reassuring, sending positive vibes to the patient, gaining his confidence, developing a close bond and a meaningful relationship. Touch has a healing effect and can send positive vibes to the patient. It also provides due warmth and reassurance and enables the development of a bond, which is a special, respectful and ethical relationship between a patient and a physician.

As discussed before, eye contact is the first mode of contact between two persons. An instant like or dislike may determine the future relationship. For a physician, and particularly a teacher, eye contact is an extremely important step towards cultivating a likeable personal relationship. It sends appropriate vibes to the other person. It is said that if you like a person at first sight you may fall in love, and if the first eye contact sends a negative signal then the mind would simply reject that person.

Eye contact can be loving as well as loathing. It can be frightful, intimidating, scaring, bullying, etc. From a public speakers point of view, the most potent tool to create a niche in the hearts and minds of the audience is eye contact. A communication expert said ‘any eye contact guides the soul and determines the future line of action’.

6.4.3 Interview

There are numerous ways of establishing human contact with the intent and purpose of gathering information to solve a problem. That is one of the basic objectives of a physician in his professional life.

An interview is one such mode. It can be formal or information. It can be personal or impersonal. It can be one-to-one or involve multiple participants (Shochet et al. 2013). It can also be general or generic or specialised and specific. An example of the former is a TV interview and of the latter, the patient’s history being taken by a physician.

An interview is defined as a structured verbal exchange between two persons with a certain objective. It begins with greetings and introduction of the participants. It then moves to establish contact, beginning with eye contact, hand shake, body gestures, looks, listening and generally getting a feel of the surrounding environment.

The next step in an interview is to develop a form of rapport. Gathering information is the next step, which obviously begins with a question. Such a question could be open-ended or closed. Usually at the beginning it is an open-ended question, which encourages the interviewee to establish verbal communication. This in turn allows the interviewer to begin a process called ‘mental mapping’ of the individual, taking into account the dress code and para-verbal parameters discussed before. Certain vibes begin to develop between the parties, which can be affirmative, is always good and encourages the interviewee to be more relaxed and positive. If the vibes are negative, the job of the interviewer is to counter the feelings to allow the interviewee to become more affirmative. Being supportive is part of the interviewer’s job unless things have already been settled and the interview is just superficial, which does happen from time to time. Things and feelings do change during an interview. What may start as a poor interview may eventually turn out to be positive and fruitful. Patience is indeed a virtue!

An interview may not be for job seeking only. A senior person may be interviewed by a panel of experts in an enquiry, a disciplinary action, a commission or simply to be a witness in a case under investigation. Doctors are sometimes asked to appear as expert witnesses, and that is a form of an interview.

The GMC wants every NHS doctor to undergo a periodical appraisal. It is a wholesome process, for which special workshops and seminars are held in various places from time to time. At the time of final appraisal with the appraiser, one has to be duly prepared for an interview leading to an appraisal and approval. Now things have moved on and the appraisal is online; nevertheless, it is an interview, for which the appraiser must be fully prepared.

At a job interview, suffice it to say that one must dress appropriately, with a pleasing demeanour, hair and facial grooming, polished shoes and a pleasant smile on the face. These are simple attributes which can give you extra marks without even opening your mouth to utter a word. As you walk into the room you must carry an air of confidence, poise and grip on the situation. Lack of confidence, a shaky walk and sweaty palms are bound to be noticed by the competent authority.

A clever candidate may be able to manoeuvre the interview gently, deliberately and imperceptibly. He may slip in a word, a sentence, a phrase which may bring out his strong point, thus enticing the interviewer to digress into his sphere and comfort zone.

Here is a format for an interview.

Greet the interviewee with a warm smile, and customary salutations.
Introduction of person or persons interviewing. Define each person's role.
Begin with the introduction of the purpose of interview and the expectations of the interviewee.
Talk about the expectations about the outcome of the interview.
Define and mutually understand the reason and the purpose of the interview, and the parameters that both parties may predetermine.
Draw upon the experience of previous interviews if any and the feedback on its productivity, usefulness and limitations, with a view to reinforcing links.
Be brief, precise and targeted in asking questions.
Make a note of the answers.
Move forward, slowly and purposefully.
Interrupt only if a genuine query crops up during the conversation.
Be an attentive listener.
Conclude within an allotted period of time, and arrive at a decision.

Interview, therefore, is a fine way of gathering information, sharing views, exploring the depth of an individual as well as building bridges for future relationships. It is an essential tool in the arsenal of a physician.

Just as it is an art to conduct or face an interview, it is an equally important element that the interview is wound down in a soft and seamless fashion. It is therefore recommended by experts in public relationships and social media and in human resource developers, often called 'capacity builders' to summarise the whole process in a succinct way, reaching certain decisions and drawing definite conclusions. Furthermore, the interview should acknowledge the accomplishments, plan future strategies, reach a consensus, and achieve a clear mandate. Finally, appropriate farewells and goodbyes are conveyed, and participants depart with a warm smile, whatever the outcome.

6.4.4 History Taking

Taking a patient's history is the most fundamental form of an interview for a physician. It is an art, and a skill which is acquired with practice. A good history can save a physician and the patient a lot of unnecessary and expensive investigations.

Seasoned clinicians consider history taking to be a serious matter. It is like a sleuth trying to nab a culprit. Many patients present with a multitude of symptoms. A good family physician can run the symptoms through his mind to filter out the relevant from the irrelevant. A physician who is attentive to a patient's history is duly rewarded in many ways. To be a patient listener is an attribute that all physicians should possess. It does not mean you allow the conversation to go on forever, as economy of time is an important factor in your busy practice. You can allocate only 10–15 min for each patient, including the time you may take in clinical examinations and investigations. It is therefore necessary to keep the conversation within the parameters so that time is not wasted in unnecessary conversation.

A medical history is the format in which you can record the patients presenting symptoms in his own words, without any corruption, alteration, addition or subtraction.

A history is also the legal evidence of your contact with the patient. It should therefore be recorded properly in the notes, or online. A history is also a form of 'professional contract' between the 'client' and the 'health provider'. A physician has the privilege to learn about the patients' intimate details of present and past life. Some things may be so personal that even the family partner may not know. So while taking the history, the basic principles of medical ethics, namely trust and confidentiality, must be duly observed.

A history is the formal way of keeping a record of the events which happened in the past, are affecting now and may affect in the future. It is one basic way of keeping matters under control, through record keeping. It is the finest method of ensuring the continuity of care, as a physician may have numerous patients and only a limited memory for faces and events. By recording clinical history in an orderly fashion, one can easily link the past to the present, even predict the future.

A typical format of history can be checked on the net, but suffice it to say that all clinical handbooks contain a format. The majority of them follow a simple pattern as follows:

Personal details
Presenting complaints
Social habits
Past medical history
Family history
Past investigations
Previous interventions
Previous treatment
Any flagged item in the notes

A history and clinical examination should be recorded and obtained in the presence of a nurse or staff member. In these days of litigation, it is best to keep all matters under control, by keeping witnesses and records in order, in case someone lodges a complaint, which can happen from time to time.

The role of communication with the patient is duly highlighted by the following study.

Scorcher and colleagues (2013) believe that effective patient-centered communication requires physicians to respond ‘in the moment’ to comments and questions. It is a valuable skill to be able to react quickly to unexpected patient utterances with empathy and support, and these surprises may be most common in general practice where patients are encouraged to speak to their doctor about anything. They developed an elective for medical students to learn and practice improvisational skills which would optimise their communications with patients during medical encounters. Nineteen 2nd-year medical students during two consecutive years ($n=38$) participated in a four-session elective which introduced and allowed them to practice the principles and skills of improvisation, and reflect on the role of those skills in their communication with patients. Specific skills that were practiced and emphasised included listening, affirmation, vocal tone modulation, nonverbal communication, agreement, collaboration, acceptance and validation.

In addition to previously developed ‘improve’ exercises, students created their own improvisation exercises targeted at specific communication. It was found that an improvisational workshop geared towards enhancing medical student communication skills has the potential to impart valuable skills essential to providing empathic, supportive patient-centred care. Communication skills training programs have become a cornerstone in medical student and postgraduate medical education over the past 20 years. Both national accreditation and expert panel consensus guidelines have stressed the importance and framed the structure for best communication practices. Exemplary curricula for teaching medical trainees in core communication strategies to use with patients have been published; many emphasise patient-centred and/or relationship centred strategies.

Simulated patient technologies with video review can allow learners to practice their skills through both self-assessment and feedback from others. However, despite these newer learning resources, frameworks and behavioural checklists, learners new to clinical patient encounters must still learn how to function and adapt within the interpersonal communicative space created by the learner and patient. At its core, this is an interactive, spontaneous process created by the events yielding unique and unanticipated outcomes. Thus, repetitive practice improves confidence but may miss the mark in learning the essential skills of intuitive and improvised interpersonal responsiveness. One could argue that existing approaches in teaching medical learners communication skills may promote rigid and stereotyped responses.

Because of the gap currently existing in interview skills training programs, the authors duly hypothesised that the field of improvisational theatre would effectively supplement the traditional curriculum. Improvisation relies on listening, confidence and responding instinctively and spontaneously.

The authors hereby describe their efforts to develop a brief curriculum for medical students providing training in the art of theatre improvisation, with the goal of enhancing students’ confidence and performance in clinical encounters. They hoped that this innovative curricular experience would establish a venue where 2nd-year medical students could learn and practice improvisational skills which might prove helpful in their communications with patients during medical encounters.

Innovation in medicine is an inevitable component of progress. Structured patients are one such example. They are increasingly being employed in clinical training. Here is a useful study to supplement this observation.

To compare the effectiveness of simulated patients with real patients through undergraduate students' results of Mini-Cex encounters and their opinions, Jabeen (2013) designed a study. She mixed both methods (combined qualitative and quantitative) at the Shifa College of Medicine/Shifa International Hospital, Islamabad during 2010.

The study included all 94 students of 4th year MBBS at Shifa College of Medicine. Their communication skills in history taking and counselling were assessed using first real patients and then simulated patients. The quantitative data were gathered from results (scores obtained) of the two encounters and was analysed using SPSS version 10. It was interpreted as mean and standard deviation, and an independent sample *t*-test was used to determine statistically the difference between the two results. The qualitative data were obtained from student interviews. The two forms of data were collected and analysed for triangulation contributing towards validation of the results and to gain a deeper insight into the relevant phenomena.

The results of history taking with real patients and simulated patients showed no significant difference ($p=0.158$). Likewise, results of counselling with real and simulated patients did not show a significant difference ($p=0.306$). The results of student interviews showed that 92/94 students (97.9 %) were in favour of using simulated patients for the assessment of communication skills. Sixty-one (64.9 %) were of the view that there was no difference between real patients and simulated patients. Ninety-one students (96.8 %) agreed that simulated patients provided motivation and 62 (66 %) indicated that the simulated patient encounter was not difficult.

In this extremely useful and technically sound study, it was noted that the students were more in favour of using simulated patients encounters for evaluation of communication skills. There was no significant difference between students performance on real and simulated patients.

It is of immense value to note that there was no statistically significant difference between the real and simulated patients, as it is relevant and quite apt for the prevailing circumstances. Real patients are difficult to gather for a multitude of communication skills required of a physician. So structured subjects are ideal for training purposes, as they can be trained to portray the part of a variety of problems. The best example could be that of breaking bad news – such as the confirmation of a malignancy – to an individual. A real patient may simply not be able to cope with the stress in a crowd of students, and might indeed succumb. A structured patient, usually an actor, can display his emotions and reactions to such news with accuracy and professionalism. So a difficult task would be achieved without causing any harm.

Pakistan has an excellent track record of medical education. King Edward Medical College and Dow Medical College, now both upgraded to the status of autonomous universities, were established before independence. The former is over 150 years old. It has a strong record of producing the finest physicians, now serving many countries in the world, and the mother country herself. This paper, written by Ali (2013) from King Edward, considers the state of the science regarding language matters in medical education, with particular attention to two informal language practices: silence and humour. Both pervade clinical training settings, although we rarely attend explicitly to them.

This paper considers the treatment of these topics in the medical field to date and introduces a selection of scholarship on silence and humour from other fields, including philosophy, sociology, anthropology, linguistics and rhetoric. Particular attention is paid to distilling the theoretical and methodological possibilities for an elaborated research agenda around silence and humour in medical education.

These two language practices assume a variety of forms and serve a range of social functions. Episodes of silence and humour are intimately tied to their relational and institutional contexts. Power often figures centrally, although not predictably.

Ali believes that a rich theoretical and methodological basis exists on which to elaborate a research agenda around silence and humour in medical education. Such research promises to reveal more fully the contributions of silence and humour to socialisation in clinical training settings.

In another study, Ali (2013) carried out an assessment of the adequacy or deficiency of relevant communication skills needed in clinical practice among students of King Edward Medical University, Pakistan, and identified the need for developing a curriculum for communication skills. In this investigation, sequential mixed method design using survey questionnaire and in-depth interviews were employed as research tools.

Final-year students consented to participate in the survey questionnaire regarding communication skills needed in clinical practice selected on the basis of random stratified sampling technique. The questioned aspects include communication skills, supervised training, breaking bad news, counselling and written communication skills. In the second qualitative phase, volunteers who had passed the final year were selected on the basis of a non-probability purposive sampling technique for recording in-depth interviews. Qualitative data were analysed with content analysis after identifying themes and trends from the data.

The study revealed that only 20 % of students had clarity of communication skills training, 28 % believed their learning was supervised, 20 % believed training was structured, 28 % were confident about handling difficult situations, 15 % could effectively break bad news, and 22 % were confident in written communication skills. In the interviews 70 % felt their peers had average skills in handling difficult situations like breaking bad news and counselling, 60 % believed the communication skills program was non-existent and 100 % agreed patient turnover is a strength for the institute and structured training would improve their communication skills performance.

The authors thought the findings were rather worrying, and observed that the communication skills of the studied group were inadequate to address special situations. They quite rightly considered that there was a pressing need for developing a communication skills training program in their renowned university.

Some 20 years ago, while conducting regular workshops for the faculty at Dow Medical, Zaidi (the senior author) had specially invited a British social scientist to train the faculty in the art of communication, particularly the most challenging task of breaking bad news. Bad news has a far deeper impact in Eastern culture due to its texture being intricately woven with several family members, horizontally, vertically and diagonally. So the present study is a fine display of the need for training the young medics in various modes of communication.

Winward et al. (2013) looked at the available evidence about the relationship between scores on the Step 2 Clinical Skills (CS) component of the United States Medical Licensing Examination and subsequent performance in residency. It focuses on the relationship between Step 2 CS communication and interpersonal skills scores and communication skills ratings that residency directors assign to residents in their first postgraduate year of internal medicine training. It represents the first large-scale evaluation of the extent to which Step 2 CS communication and interpersonal skills scores can be extrapolated to examine performance in supervised practice.

Hierarchical linear modelling techniques were used to examine the relationships among examinee characteristics, residency program characteristics, and residency-director-provided ratings. The sample comprised 6,306 examinees from 238 internal medicine residency programs which completed Step 2 CS for the first time in 2005 and received ratings during their 1st year of internal medicine residency training.

The investigation resulted in the findings that the relationship is modest, Step 2 CS communication and interpersonal skills scores predicting communication skills ratings for 1st-year internal medicine residents after accounting for other factors.

The results of this study make a reasonable case for Step 2 CS communication and interpersonal skills scores providing useful information for predicting the level of communication skill that examinees will display in their 1st year of internal medicine residency training. This finding demonstrates some level of extrapolation from the testing context to behaviour in supervised practice, thus providing validity-related evidence for using Step 2 CS communication and interpersonal skills scores in high-stakes decisions.

Most Caribbean medical schools are dedicated to preparing undergraduates to assimilate smoothly into the North American health services.

AUB is dedicated to getting the best possible results to achieve that. Thus the study could be a great benefit to all such institutions aiming for higher goals in life.

Caribbean schools follow the US modelled curriculum, but not many have included such subjects as medical ethics, communication skills, research at undergraduate level, writing skills and EBM, which are an integral part of the American University of Barbados School of Medicine. Therefore it is with great interest that the following study is included here.

Shankar et al. (2013) have just published an extremely pertinent study from a Caribbean medical school. They mention that the attitude of medical students towards communication skills is important for curriculum planners and teachers. Xavier University School of Medicine (XUSOM) is a private medical school admitting students mainly from the United States and Canada.

The subject he studied is related to communication skills, which have not been previously studied in the institution. Hence the present study was carried out. The study was carried out among the first, second, third and fourth semester undergraduate medical (MD) students during July 2013 using the communication skills attitude scale (CSAS). Respondents' age, gender, nationality, occupation of parents, place of residence of family and semester of study were noted. The positive and negative attitude scale scores were calculated and compared between the different subgroups of respondents ($p < 0.05$).

In this study, 51 of the 73 students (69.9 %) participated. The majority were between 20 and 25 years of age, of American nationality, from metro cities and had excellent or good self-perceived verbal and written communication skills. The mean positive attitude scale (PAS) score was 47.65 (the maximum being 65) and the mean negative attitude scale (NAS) score was 31.06 (maximum 65). The PAS score was significantly higher among respondents whose fathers were not in health-related professions. NAS scores were significantly lower among the third and fourth semester respondents.

It was observed that, overall, the students had a positive attitude towards communication skills but there were also a few negative attitudes. Based on results of the study and a review of the literature, his institution is planning to start communication skills learning in the institution right from the first semester and students will be provided with opportunities for supervised practice during early clinical exposure, hospital observership and with standardised patients. They also plan to expand the medical humanities module and communication skills in their curriculum

6.4.5 Gathering Information: A Questionnaire

An interview can also be carried out through a questionnaire. In fact it is a common method employed by most researchers, scientists and physicians. Many questionnaires are brief, simple and easy to answer, but some can be complex. Some of them carry simple close ended questions like how many children do you have, do you smoke, etc. However, many can be open ended, giving leverage to the responder, such as questions on exercise, walking or social habits, etc.

Questionnaires can be online or in printed form. The former are becoming routine now and paperwork is slowly but steadily disappearing. The younger crowd love it, but those reaching a certain age find it hard, cumbersome and wasteful.

Many questioners use previous data generated by gathering information from previous surveys. So they often appear to be familiar and easy to tackle. In fact most are straightforward, as the person sending is genuine and earnest in seeking information. Questionnaires are developed by experts in human psychology, information technology, data processing, data synthesis, data analysis, etc. beyond the level of generating data, one major reason for the questionnaires being to share data with other agencies with common aims and objectives.

There has been a lot of talk amongst the educationists on the use of the latest technology, particularly e-learning. Web designing is a specialty and here is an illustration of web technique to be used in medical education.

Simmons et al. (2005) reiterate that learning how to conduct a medical interview and perform a physical examination is fundamental to the practice of medicine; however, they remind us that when this project began, the methods used to teach these skills to medical students at the University of Toronto had not changed significantly since the early 1990s despite increasing outpatient care, shorter hospital stays and heavy preceptor workloads. In response, a Web-based clinical skills resource was developed for the 1st-year undergraduate medical course – The Art and Science of Clinical Medicine I (ASCM I).

They inform us about their experiences with the development of the ASCM I website and detail the challenges and motivators inherent in the production of a Web-based, multimedia medical education tool at a large Canadian medical school.

They discovered that in their study the motivating factors included team attributes such as strong leadership and judicious use of medical students and faculty volunteers as developers. Other motivators included a growing lack of instructional equivalency across diverse clinical teaching sites and financial and resource support by the Faculty of Medicine. They also discuss the barriers to development included an administrative environment that did not yet fully incorporate information technology into its teaching vision and framework, the lack of academic incentive for faculty participation, and inadequate technical support, space and equipment.

The study concluded that success of electronic educational resources such as the ASCM I website caused a significant cultural shift within the Faculty of Medicine, resulting in the provision of more space, resources, and support for IT endeavours in the undergraduate medical curriculum.

Mullangi (2013) recorded a commentary in which a 4th-year medical student argues for the relevance of the arts and humanities and the need to sustain medical students' exposure to these through the medical curriculum. She writes that the point of incorporating the visual arts, literature, music and other arts into the curriculum is not necessarily to "teach" professionalism but, rather, to offer students a viable, lifelong tool to reorient themselves as they move along in their training. The advantages the humanities offer are multifactorial: they offer a space for discussion about topics such as death, dying and coping with dying patients-such that students can feel safe and objective in sharing thoughts; they remind students of the patient experience; they eloquently distil muddy feelings into nuanced words; and they serve as an anchoring point for a state of mind that nurtures reflection over the disdain encouraged by the "hidden curriculum" of the wards.

It is a wonderful study duly highlighting the viewpoint we have expressed elsewhere in this book that instead of teaching zoology and botany in premed years, they should be teaching humanities. The reason for our argument is duly augmented by Mullangi, that the knowledge of human history, philosophy, literature, poetry, anthropology, etc. adds to the richness of personality. A physician deals with sensitive matters, and the knowledge of human actions, human responses and social and behavioural sciences would make him a better human being and definitely a better physician.

6.4.6 Interpretation and Interpreters

In many countries with multilingual, multicultural populations, it has now become essential to employ professional interpreters in interviews of clients, patients and other stakeholders.

In Britain, the NHS, crown courts, embassies, etc. employ such professionals for gathering information, conveying decisions, etc.

They are well trained, well groomed, pleasant persons, who are often multilingual, with definite expertise in at least a couple of languages. It is their professional commitment to translate as honestly, clearly and professionally as possible. The interpreter must not add, subtract, modify, underplay or overplay a statement. Such a practice may not just result in wrong decisions but indeed bring harm to an individual. Practice shows that many times even professional interpreters tend to influence the conversation by either augmenting or diminishing the impact, which is unethical.

One may never use a family member for interpretation, as it is only human to sympathise, resulting in a biased decision. An elderly mother complaining of arthritic pain in her knees may be genuine, but the family member interpreting for her might just add an adjective or two such as 'very severe, more crippling or unbearable' in good faith to seek better attention. It may, however, influence the treatment adversely.

In the UK, many languages are spoken by patients and it is often difficult to find an appropriate interpreter. Many agencies help out in such situations. Most are highly skilled professional interpreters, but some are part-timers, such as university students. One has no choice but to trust their honesty and integrity in translation. Telephonic services are also available through the agencies and are quite helpful.

6.4.7 Presentation Skills

Presentation is an art. It is either natural, as is often the case, or it is cultivated through observation, coaching, learning and practice. Many professional sales people are so smooth in their style and substance that you are bound to be impressed. It is their job, and they do it well. Their physical appearance is immaculate, with well groomed persona, neat and tidy attire, shining teeth, polished shoes and so on.

Most doctors are good presenters. Some, by virtue of natural talent, others through training and peer pressure.

There are many professional manuals available to guide a medical student or doctor in developing such skills, but here is a simple and practical guide.

Before preparing for a presentation, go through the requirements of the event. Is it a debate, a discussion, a clinical meeting, a seminar, a conference or a congress? You must know the level of the event to prepare accordingly.

Then you must identify the objectives of the event. What are the aims and objectives? Aim is a pathway and objective is what you want to achieve. This distinction may not be known to all, but should be clear and duly respected in your preparation.

For instance, the objective is to promote health in pregnant mothers, and the aim is to correct the inherent anaemia to achieve that objective.

Likewise, in an event, identify the aims and the objectives accordingly. Is it preventive, curative or rehabilitative? Is it clinical or non-clinical? Is it research-based or simply educational? Is it specific in nature dedicated to a particular subject or specialty or general and non-specific? Is it for health awareness or health promotion? Is it a one-off event or part of a series? Is it to be recorded for later use, or simply extempore speech, and so on? Is it a workshop, where you are asked to demonstrate a certain skill or train the participants in learning a certain technique?

Remember the one generic aim of any presentation is to educate the audience with the objective that they improve their acts after listening to you.

There may be certain general aims, which are indeed the most common reasons for presentations by medical students and physicians. The objective is sharing your knowledge and skills with the peers. It not only enables you to disseminate knowledge and to stimulate debate on established principles as well as controversial topics – this is perhaps the finest way to serve education. It also enables the presenter to persuade the listeners to accept the point of view, to improve the services, serve mankind or simply accept a product as something to think about, adopt or buy. Salesmen do it all the time. They could be so persuasive that you may end up buying a product you may not even need.

A presentation can be prepared in many ways. However, experts have devised a formula for a successful presentation based upon one fundamental instinct of all human beings, namely curiosity.

So find out who, why, when, what and where before a presentation.

Who are the participants in the event and what is their level of perception of the subject you are about to present? If you know these two facts you can tailors your talk according to their level. No use talking philosophy to a vendor, just as no point in trying to sell coal to a miner!

The level of the attendants intellect, knowledge and know-how can play an important role. The best speakers are those who can raise or lower the level of their talk depending upon the participants. If it is a gathering of learned men, obviously you would like to be on par with them and not insult their intelligence by wasting their time and your energy on ordinary and routine matters. Likewise, if the audience consists of young medics or young students in a university, you may have to spend some time in laying the foundation before building a block or a high riser, and so forth.

It is a profitable exercise to know the needs or expectations of the audience. Many people may wish to attend your presentation because they may have heard or met you before and genuinely like you. They are your best friends, expecting due rewards of loyalty, so watch out and do not disappoint them.

Then there may be some who are seekers of knowledge and would like to ask you a question or two to resolve any issues. Some may even want to participate, to share their knowledge and experience with the audience through your platform. Watch out, as they may want to consume your time and your podium to their advantage. One particular colleague comes to mind. He would never do a presentation himself, but in each notable presentation, he had to get up, introduce himself to the audience at leisure, and then ask a silly question just to register his presence. Watch out for such characters, as they could be harmful if confronted. So the answer is to be polite and brief in reply.

Some attend a session as part of mandatory training. This is often the case in the NHS. Most participants attend for obvious reasons such as to learn, but some just attend, yawning, scribbling on their notepads, and simply sit there and exude boredom all around. They can be irritating, but learn to live with such scenarios. One top class international speaker, who spoke without notes or PowerPoint, etc., would simply close his eyes and talk for an hour. She was an exceptional speaker with English as a second language but what authority she possessed in her tone and style. No one could ignore her.

One essential aspect of knowing about the prospective audience is the level to which you want to raise your level or drop it to suit them.

6.4.8 Workshops

Workshops are extremely popular these days. Some of them are mandatory in the NHS, UK, others are available in medical schools, universities, even defence councils for anyone interested in learning new techniques, new skills, and innovative technologies.

Most medical schools and universities use them on a daily basis. Professional instructors are hired by many institutions to run the workshops. So what are workshops?

Most workshops are planned, organised and conducted by a team rather than individual. A workshop is an interactive exercise involving participants under the tutelage of the team of conductors. Each can last for 1–3 days.

A workshop is conceived by the medical education department or the dean and his academic faculty, keeping in view the requirement of the university or its medical school. It involves thinking about and choosing a topic, planning its modus operandi, the perspective participants, the faculty, the logistics, the questionnaires, the feedback forms, and future workshops to continue the process of education, knowledge and skills.

In planning a workshop, once again the ageless questions should be kept in mind.

Why do you need a workshop? In other words, the learning objectives of a workshop must be clearly identified. It is an exercise involving time, space and efforts of many people. So unless the objectives are absolutely clear, and mutually agreed upon by the team of conductors, the outcome of the whole activity may not be good enough to justify it.

6.4.9 Choice of Topic

The whole exercise is to be based on the topic of the workshop. It is therefore the most fundamental single element which deserves to be thought about over and over again. During the faculty meetings, many topics may emerge out of the discussion, but each has to be sighted by the academic members with the sole objective in mind of defining the purpose. If the intentions are clear as to what is the purpose of holding a workshop, the topics will become obvious too. After a brainstorming session it is the task of the department of medical education to narrow down and finalise a topic amongst the many topics proposed or discussed amongst the faculty. Taking the faculty into confidence is absolutely the first step towards the successful completion of a workshop.

6.4.10 Theme

In order to achieve the objectives, what is the main theme on which the workshop is to be based and what subjects would require to be covered by the team of the instructors? It has to be made absolutely clear to all parties beforehand as to what is expected of them in the whole activity. Lack of clarity in the mind of the faculty surely means the participants would fail the activity.

Another important factor affecting the workshop is the factor of time allocation. Economy of time is an important element in all professional activities. The same applies to the workshops. Time is money. It is a universal principle which is why each workshop must give due consideration to time allocation. The professional workshop conductors specify the time for each activity. Each workshop us comprised of many activities which should be allocated the time necessary for each given task to be achieved.

The next item to remember in planning a workshop is the procurement of adequate resources. No workshop can be productive if the resources are efficient. These resources consist of two fundamental components, namely, the personnel and the logistics.

6.4.11 Personnel

A workshop is mainly dependant on the human resources available. The personnel involved are the main person conducting the workshop together with the assistants or secretarial staff involved in the preparation of the handouts, etc.

The conductor or the person in charge leads the way forward, albeit as a team. He should be fully conversant with the purpose and personnel of the workshop, and should possess leadership qualities. A successful director of a workshop is a master of the subject and fills in any gap in personnel in case of illness, etc.

The assistants should be fully trained in their own fields, fully trained to conduct the workshop, know its philosophy and principles and maintain close coordination and excellent communication with the team and the participants.

6.4.12 Logistics

A workshop is best conducted in an informal environment. The participants should wear simple and informal attire so they can relax while working with the group in group activities.

The seating arrangement is also informal, comfortable, oval or semicircular. Each participant thus faces the workshop instructor. For an activity, a few tables should be available for the groups to lay down blank sheets or flip cards to engage in various tasks.

A table should be laid out just outside the entrance room with name badges for each participant, an attendance sheet and plenty of writing material.

Inside the workshop room, in the right hand corner of the room, one may store a flip chart and, indeed, another on the other side of the room. Since most people are right handed they prefer to stand in the right corner. The whole idea is that the speaker should face the audience at close range. Because the principle of a workshop is to have an informal interactive dialogue rather than a lecture-type monologue, the seating, lighting, positioning of the speaker and his paraphernalia, etc. should carry an air of informality.

The room should have the usual multimedia and overhead projection facilities. No amplification is required in a medium size room with decent acoustics.

Finally, plenty of flip chart blank papers should be available on the board as well as in a corner table with multi-coloured markers to be used in the group activities.

6.4.13 Modus Operandi

Each conductor may have his own way of running a workshop. By and large it begins with the introduction of the facilitators and the participants. This is followed by filling up of a pre-workshop questionnaire.

At the outset, the conductor of the workshop gives a brief introductory plenary talk. This is followed by a task given to the participants.

The participants are split up into groups of four or five and asked to name themselves by a pseudonym, which should be short and funny.

The task has to be specific and problem solving, with clearly mentioned learning objectives. Normally half an hour for each group activity is sufficient, at the end of which each group should write down a few points, draw a chart or a picture, etc. on the white paper sheet.

Each group is then invited by the facilitator to present their task to the audience. It is best advised that for each activity a different presenter is chosen by the group, as some people are overactive, others dormant. The whole idea of a group activity is to involve each and every member of the group on an equal basis.

Usually 5 min are allocated for each presentation and a quick question or comment session.

After a brief coffee break, another plenary talk is followed by another group activity, and so on. The whole exercise usually ends by late afternoon with several charts displayed all along the walls of the room and several points and critiques noted down by the participants.

Finally, the facilitator sums it all up, duly highlighting the achievements of the day and deficiencies that may require a further session.

A post-workshop feedback through a verbal round and a chart or a form helps in further developing the workshop. The pre- and post-workshop opinion poll should be anonymous and unbiased. This is the best way forward in terms of improving the activity for the future.

In the present environment of hands-on training, workshops play a major role. The finest examples can be seen in the BLS, ALS, TLS and similar courses. Furthermore, in advanced surgical training, hands-on training workshops give participants a supervised first-hand experience of learning an art or a skill. For instance, surgical workshops on fundamental use of ligatures and sutures, temporal bone dissection, Functional Endoscopic Sinus Surgery FESS, use of lasers, etc., just to quote a few.

In fact, with growing restrictions on patient handling, many other workshops are coming up each day. Many professional agencies are often invited to conduct such workshops which train a young doctor to cope with problems he may encounter in practical life. For instance, how to handle an angry client, conflict resolution, weight lifting and handling, fire safety, treating minors and the mentally handicapped, elderly and disabled, etc. are very popular workshops in many centres across the teaching institutions.

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Clinical Teaching 7

Medical education is not confined to the basic sciences only. After the initial couple of years in which a foundation is laid for future knowledge and skills development, the real task begins.

Clinical teaching is a lifelong activity. As mentioned on several occasions in the previous chapters, medicine is indeed a lifelong profession, which does not allow laziness, particularly in maintaining one's level of knowledge and skills quite up to date.

One of the essential components of modern medical education is the principle of continuing medical education, i.e. CME. It is the best way to maintain and upgrade the practicing standard of medicine.

The licensing bodies in every country insist upon maintaining a certain degree of proficiency through regular attendance and participation in the professional and academic meeting for which x number of credit hours are gained per attendance, accruing over a period of a year. In the UK, the GMC insists on annual appraisal through sophisticated computer software which covers all your activities during the appraisal year. The next step is revalidation, which will ensure that every practitioner on the GMC register has valid qualifications and matching skills for the job he is employed to do.

CME is of immense importance in the USA. Organisers of academic conferences advertise their activities on the basis of the credit hours the conference will provide to attract participants. It works as a chemotactic factor. CME is offered by all major and many smaller teaching and training institutions.

7.1 Clinical Teaching in an Outpatient or Ambulatory Service

This is the commonest way of imparting education and demonstration of necessary skills to a batch of clinical students. It is time honoured, universal and generally accepted as the best way so far.

S. Zaidi, M. Nasir, *Teaching and Learning Methods in Medicine*,
DOI 10.1007/978-3-319-06850-3_7

In an outpatient set-up, the students learn through interrogation, observation, discussion, questions and answers and practical demonstration.

There are several ways of outpatient teaching. The one practiced by the senior writer (Zaidi) was basically problem solving. Long before the term was coined he had picked up from teachers in medical college as well as in British teaching hospitals that a student learns best by solving a dilemma. So it was his practice to allow students to pick up a case from outpatients and a group of four or five students would take the history, perform the basic clinical examination with the patient's consent and then present the history and the physical findings to the group of 20 or so in the presence of the teacher. Debate would follow and active learning through questions and cross questions would go on for about 15 min, when the teacher would summarise the issues, correct the diagnosis if wrong, then go on the discuss further investigations and management.

This practice went on for over 30 years, gaining much popularity with the students and the colleagues. His way of teaching was quite different onto other celebrities. The teacher neither dictated notes nor gave formal lectures. His approach was simple, practical and proved to be quite successful, i.e. small group discussions, tutorials, demonstration of clinical skills and problem solving. This happened between 1972 and 2001 on regular basis. Some of his students, now professors in Columbia, Duke and elsewhere, still recall those early days of their medical schooling with great fondness and appreciation.

So to say that PBL is entirely new is wrong – it had existed long before it was given its formal label per se, albeit it had not been applied to the preclinical years in those days. There was one teacher in biochemistry at Dow Medical College, Karachi, who as early as 1966 used to say that teaching about the thyroid separate from the pancreas or kidney made no sense; it should all be integrated as the patient does not carry a heart or a liver in his hand. He presents a clinical picture. It is the job of the doctor to figure out whether he has a problem with his heart or his kidney, and so on. The professor was a visionary. Alas, no one paid heed to his call.

7.2 How to Make the Best of Experiential Learning

The following salient steps are recommended:

Instruct the learner to interrogate a patient
Reflect on the trigger points in history
Reflect on his observation
Highlight certain general rules of clinical examination
Discuss, debate, explain and raise questions
Learn to apply in the next patient or a clinical scenario

As discussed elsewhere in this book, history taking is an art. It is the most fundamental element in clinical practice. To be able to explore the problem by simple conversation is a trait which must be cultivated and honed by every medical student.

To be a patient listener is the first step, followed by interjections at appropriate times. Open-ended questions should be avoided and direct questioning is to be discouraged. A proper history is actually a narrative in the patient's own words. The patient should be encouraged to describe his feeling, symptoms, and even demonstrate any signs without hesitation. A sound history is necessary to get a clinician thinking in the right direction.

Sometimes an interrogator my slip in a trigger statement or query during the statement, such as, 'a history of fever, or nausea, etc.'. Sometimes, a patient may drift away during a statement, so a trigger point or a query may be used as a 'correcting activity'.

Then there is the question of observation. Every human being is endowed with the power of observation. A clinician should use, indeed cultivate, this attribute to his best advantage in a clinical setting. To note simple elements such as the way the patient was dressed, his nails, his general demeanour, his gait, eye contact, posture, position and movements, etc. can all carry a few tell-tale signs. So a medical student should be trained to observe even the tiniest of unusual things in a patient, which may carry a clue towards the provisional diagnosis.

It is the primary duly of a clinical tutor to teach and demonstrate the fundamentals of clinical examination, beginning with empathy, greetings, mannerism, politeness and permission for examination. Then a step-wise physical examination of the body parts suspected to harbour the disease, maintaining the principle of confidentiality, personal dignity, etc.. Manuals of clinical teaching discuss the details at length.

During the presentation part of this session of outpatient teaching, the student gives an account of the history and his clinical findings. He then comes up with a provisional diagnosis based upon clinical reasons derived from the data. Investigations are duly mentioned and the future direction of the management established. The tutor then completes the picture with his input and the discussion is brought to an end.

Now if we compare it with the PBL, we find many similarities. Beginning with data, generation of hypothesis, identifying the learning objectives and resources right up until problem solving, the pattern is similar. The major difference is that a PBL module may take a few weeks to cover a given system, while the clinical outpatient session covers a subject or a clinical case scenario in one sitting. Of course it may be repeated many times with different patients adding further information as it goes along.

In a clinical setting, the process of active learning continues throughout the posting. The students, of course, move on to different clinical postings during the term, gathering relevant knowledge and skills in each one.

7.3 Economy of Time in Clinical Teaching

Most clinical rotations are covered in 2–3 years, depending upon the duration of the degree. There is much to teach and much to learn. Time is always an issue. Therefore good clinical teachers know how to put the time to best use. Time efficiency is an art. Without giving the impression of haste, a good teacher can cut off a session at an appropriate point in time – this comes with experience.

Right at the outset a teacher may define the time allocation for a particular activity. Say, for instance, with a batch of 12 students, he may divide them into 3 groups of 4 students, each group being given a different case for preparation and presentation in, say, half an hour. So while the first 15 min are allocated for history taking and physical examination by each group separately, the next 15 min are shared by all, so that while one batch presents the other batches can learn through clinical reasoning, critique, debate and discussion.

This may not be possible everywhere. In the UK, at least in otolaryngology, for instance, one or two students are allocated per clinician in the outpatients. So, for instance, in ENT, each student spends 10 PA/sessions, i.e. 5 working days with all the clinicians in the deportment covering otology, head and neck, MDT, rhinology, general ENT, audiology and operative sessions.

A clinical tutor should teach the learners how to focus on the learning objectives such as history taking or physical examination within a specified time allocation. Time management in outpatient care is of immense importance. While the students are completing their task, the clinician may do his job and see the other patients, thus practicing what he preaches.

Senior clinical students are best taught through Evidence Based methods, as EBM is what they have to practice in their practical life. They should also be encouraged to participate in seminars, or clinical meetings, presenting a case of clinical interest or a poster, or a study designed to learn more about common problems in the community.

During clinical teaching, a student should always learn the correct technique of documentation. Accurate, precise and relevant documentation must form an integral part of clinical teaching. As society becomes paperless, such documents are recorded on the CDA, or the Clinical Data Archive. Easy accessibility is one major advantage of CDA, but students are best advised to learn the ropes through paper documentation.

Technology is expanding so rapidly that, in a few years, every document will probably be electronically saved and transported. It is already happening, but paper files are still in vogue, at least in Britain, in most if not all hospitals. However, it is only a matter of time before they disappear altogether.

7.4 Small Group Clinical Teaching

As mentioned before, small group clinical teaching has been in vogue for decades, albeit without being labelled as such. In any teaching environment, group discussions, morning meetings, case discussions and visits to different departments such as radiology, pathology, etc. for discussion of a scan or a histology film as a group activity is the norm.

It is ideal to plan a small group activity with the team of clinical teachers, so that the same subject or topic or system is not repeated at the cost of leaving other subjects untouched, and to have brainstorming to evolve new teaching strategies.

Most small group clinical teachings happen to be teacher-centred, i.e. pedagogal. This has changed in recent years as more and more teachers are getting used to the idea of students taking the lead. It was the author's (Zaidi) practice for many years to let the students prepare a case, present it and discuss it in the presence of the teacher, who would simply guide the discussion and facilitate it toward a chosen goal. For instance, a patient presenting with Bell's palsy would be prepared by the student, covering the anatomy and physiology of facial nerve paralysis, followed by clinical manifestations. The teacher would then discuss the finer details such as the medical or surgical management, employing the good old blackboard and chalk for drawings or flip charts for further elaboration. Sometimes a PowerPoint presentation was employed to highlight the points, or indeed a short operative film to display the surgical exploration of facial nerve in traumatic paresis.

The other teachers in the department would discuss other issues with the same set of students without replication of facial paralysis, and so on.

In the modern setting, mostly in those institutions where PBL is gaining ground, brainstorming sessions are useful for many reasons. For instance the group may concentrate upon:

The learning objectives
Choosing the topic or topics
Reaching a consensus on teaching strategy
Identifying and planning for the best learning environment
Logistics
Students' desires and their level of knowledge and skills

The main purpose of a group activity is to encourage group participation and sharing of experience, skills and techniques. It should be student-centred, with the clear objectives of expanding the knowledge base if the students promote critical thinking, synthesis and analysis of a clinical case, improve the clinical problem solving skills and learn the art of communication and leadership.

The learning environment also plays an important role in small group clinical teaching. In an outpatients department it is usually carried out in a small consulting room. So ideally there may not be more than two or three students per teacher, but it may not be possible in all settings. So the alternatives will depend upon the facilities available. In a family practice, once again it may to be group of two or three students at any given time. In larger practices or ambulatory care or community visits, larger groups may be accommodated.

Teaching through the patients is an art and a science. In a small group of a clinical batch, a plan of activities may need to be followed, as described below.

1. Greeting, and introduction.
   Mannerism and empathy are the first steps towards building a relationship with a patient. So saying good morning or afternoon doesn't cost a penny but can be helpful in developing rapport. Likewise, simply addressing the patient by his or

her name as Mr so and so, etc. is always helpful. Offering a seat and then introducing yourself should be the next step.

The introduction should include your name and position as well as the purpose of your interview.

2. History taking has been discussed before. It is the most important component of patient care and should be given due significance.
3. An interesting case relevant to the learning objective may have been chosen by the teacher, so the student may present the case in chronological order, beginning with history, the presenting complaints, the past history, the family history, social history, etc. up to the clinical findings.
4. Depending upon the choice of the teacher and the group, some students may then discuss the provisional diagnosis to solve the dilemma, others may debate the investigations to reach a final diagnosis. Experts describe three types of cases that can be employed in teaching.
   (a) Decision/dilemmas cases. They present problems that require a solution.
   (b) Appraisal cases. These cases are often employed to teach analytical skills. Simple questions about the diagnosis or treatment plan may be asked, thereby stimulating analytical discussion by the group.
   (c) Historical cases. Such a case can serve as an illustration of clinical care in action. For instance, the use of an antibiotic in the past illness, leading to the development of resistance, followed by a new antibiotic for the same illness.

7.5 Basic Rules of Clinical Teaching (Through Patients)

Every clinical teacher has his own ways of teaching through the patients. However, the basic rules are usually universal. It is always comforting to use small groups for a brief period of time to impart education or transfer a particular clinical skill. For instance, dealing with a patient of chronic lung disease; the art of examining a chest through the conventional cardinal ways, i.e. inspection, palpation, percussion and auscultation. This could be taught in one sitting to one small a group in maybe 20 min or so. The exercise may be repeated with a different patient and a different scenario with the same batch of students if needed. If the clinical skill is more complex and the patient may feel tired or fatigued, the process may be deferred until later, or taught through a different patient. Remember, any patient who has allowed you to teach has contributed to the cause of education. His pleasure should always remain paramount and due gratitude should be expressed to him at the termination of the teaching session.

Then begin by asking a simple question about illness, with sufficient waiting time for the patient to ask why, rather than you giving an explanation at the outset. Volunteering information relating to the patient's illness may kill the discussion and damage the learning objectives. Once a question is raised by the patient, the teacher may divert it to the students to respond and encourage the discussion towards a desired goal.

The teaching may then move on to the next step; when the why bit is answered, the patient may ask why. Once again the teacher may throw the question to the students to think critically, analytically and logically to help reach a certain conclusion. Of course it should all be mentored by the teacher, without giving a definite answer. Simply adding a piece of relevant information or triggering a point in discussion may be needed, so that the clinical debate progresses as desired. Always keep the learning objectives in view.

What to do could be the next step. This question is obviously the reason for the patients' visit, so he may ask it, or the teacher may throw the query to the students. This would stimulate the debate towards the diagnostic part, investigative procedures, etc. and finally focus on the treatment or further plan of action.

The fundamental rule of attentive listening is a valuable tool of teaching. Let the patient talk uninterrupted unless he digresses away. A probing question at an appropriate time would bring him back to the point of interest. Active conversation, and, from time to time, questioning followed by another piece of information and another question, helps in building up the story to a natural finish.

Clinical teachers acquire certain personal ways of teaching. By and large it happens to nearly every teacher as the process is repeated and rehearsed so many times over the years that it becomes second nature to him. Pertinent probing and relevant questions are somehow stored in the teacher's memory for each type of case that he sees in clinical practice. So they just come naturally to him. And since he has been practicing a certain way of clinical examination or a certain clinical skill almost on a daily basis, this also comes naturally to him.

It may safely be reiterated that 'practice makes perfect'. The same applies to the art of teaching through patient both regarding knowledge and skills. The most important element of patient care, both ambulatory and non–ambulatory, is the art of communication.

The following study duly highlights the importance of communication skills, interviewing techniques and empathy, the attributes that a physician should possess. Sennekamp et al. (2012) agree that communication skills and proper behaviour during medical consultations have been shown to improve the doctor-patient relationships, and they believe it should therefore be an integral part of medical training.

The study was carried out in Germany, where, according to these authors; there are almost no reliable and validated checklists for assessing communication skills during medical examinations. The study aimed at developing a first valid German checklist to evaluate communication skills which they called the Frankfurt Observer Communication Checklist (FrOCK).

The checklist was developed according to a set of requirements to be met by medical training checklists. It was pilot tested, revised and validated over several steps. Data analysis was carried out in 371 assessments (371 students) by 17 examiners. They checked out the validity and comprehensibility by comparing a trained and an untrained group of students and testing for both inter- and intrarater reliability. Interrater reliability was analysed by means of 37 interviews which were simultaneously assessed by 5 examiners. Intrarater reliability was calculated by having 3 examiners assess the same 37 students at 2 different points in time. So it was a statistically designed, very specific study involving a fairly large sample for this targeted purpose.

The study concentrated on four areas:

1. The beginning and conclusion of the interview
2. The technique of interrogation
3. Empathy and contact skills (used in physical examination)
4. History taking

The authors were quite satisfied with the validity and reliability of the study, concluding that FrOCK offered a clear and concise checklist for assessing communication skills in medical examinations and one which satisfies psychometric requirements as well.

The authors believe it could be a useful tool for assessing communication skills in medical examinations, as it takes only 3–5 min to complete.

It appears to be a fairly good monitor for the purpose required. Undoubtedly the attributes of communication with the patient are those mentioned here. Perhaps one may add a few more. attributes, depending upon the culture and customs of the patient. For instance, in an Eastern culture, a family member may like to sit in at the interview. The doctor may then have to take this factor into account when dealing with a patient. We must remember that our patients come from wide and varied backgrounds, particularly if you are practicing in a pluralistic society, and culture sensitivity is an essential part of medical ethics.

7.6 Inpatient Teaching

It is a fading art. Regrettably, those days of formal, inpatient teaching where the teacher could demonstrate the art and skills of interrogating, examining, allowing pupils to do the same, are all but gone. Ethical teaching dictates that the patient's rights to confidentiality, privacy and self-respect may not allow a gathering of students to stand around the bed and openly discuss the patient's details, while the rest of the ward hears. It is still practiced in some places, albeit more often in the conference room after a ward round.

It was common practice until a few years ago. One may even recall James Robertson Justice playing the role of a British consultant doing his rounds with a matron and an entourage of his pupils. He played the part as close to real life as possible. He looked and lived the part. Early days in the NHS involved a lot of innovative techniques of teaching. One of them was a morning round, where each case was presented by the SHO to the mob, with a few inputs about the investigations and treatment by the registrar and the final word by the consultant. It was called a teaching round and was thoroughly enjoyed by the students. It was also the most practical way of imparting clinical skills to a student, under the watchful eyes of seniors and peers.

Currently, inpatient teaching has become a personalised individual effort. Students and young interns learn through self-education, and occasional input by a registrar.

Consultants are not obliged to conduct a teaching ward round, though they see their patients as and when needed.

The NHS was designed to serve the sick. Teaching was a corollary to the basic service. It has changed somewhat, as everyone has to fulfil certain educational requirements every year to continue personal professional development. More courses and facilities for educational seminars, workshops, lunch time meetings, etc. are regularly available to everyone interested.

Stutchfield et al. (2011) discussed in a study that, with the recent 'working-time'-related changes to surgical training structure, the value of dedicated research during surgical training has been questioned. They carried out an online survey examining career and academic outcomes following a period of surgically-related dedicated research at a Scottish University between 1972 and 2007. Of 58 individuals identified, contact details were available for 49 and 43 (88 %) responded. Of the respondents, 95 % ($n=41$) continue to pursue a career in surgery and 41% ($n=17$) are currently in academic positions; 91 % ($n=39$) had published one or more first-author peer-reviewed articles directly related to their research, with 53 % ($n=23$) publishing three or more. Respondents with a clinical component to their research published significantly more papers than those with purely laboratory-based research ($P=0.04$); 81 % ($n=35$) thought research was necessary for career progression, but only 42 % ($n=18$) felt research should be integral with training. In conclusion, the majority of surgical trainees completing a dedicated research period published papers and continued to pursue a surgical career with a research interest. A period of dedicated research was thought necessary for career progression, but few thought dedicated research should be integral with surgical training.

To conduct research ought to be an obligation rather than a need. In fact most doctors find it unnecessary to indulge in the luxury of research once they have achieved their target in terms of a substantive job in the NHS. No doubt career development is mandatory, but hard core research is often confined to major university hospitals and individuals who have a desire to achieve more than becoming a consultant and settling down into a comfortable life.

The North American Model is basically teaching-centred. Therefore more formal sessions such as morning meetings, case presentations, coffee break sessions, lunch time case discussions, etc. are regularly seen in American hospitals.

The fundamentals of inpatient teaching are:

Interrogation skills. History taking. Chronological data recording.

Clinical/physical examination, observing the principles of ethics, namely autonomy, i.e. consent, privacy, dignity and confidentiality.

Requesting investigations or carrying out a procedure observing beneficence and non-malificence.

Arranging a review by a senior.

Timely referral to another department.
Transfer to another service/hospital.
Keeping the patient and the next of kin fully informed.
Archiving all data safely and ethically.
Time management.
Keeping the factor of resource allocation in view.

Let us now discuss some of these elements.

Interrogation and proper history taking is an art, which all clinicians must possess. Obviously, once you have introduced yourself to the patient and greeted him, you should ask the first and foremost questions in a simple form such as 'so Mr. Doe, how are you feeling today'? This should open up the conversation and establish a dialogue. Once you have listened patiently to his present conditions, you may want to know about the previous history, investigations, procedures, hospitalisations, etc. You should make a note of all the information thus gathered in chronological order. The patient may want to know about the future line of action, which is what you explain to him in the light of instructions you have received from your seniors or attending.

Clinical or physical examination should follow verbal consent. Standard manuals of clinical practice have described the steps one should take. So the reader is referred to such a manual for further guidance. Suffice it to say that no physical examination may be taken lightly. It is surprising how much pertinent information can be gathered through a methodical and systemic examination of a patient. Details must be jotted down in a chronological order, duly highlighting the salient features and positive findings of an examination. These focal points need to be discussed with seniors or a batch of trainees to share the experience, and indeed to eliminate any false positives. What may appear to be a fluctuating mass may be caused by an abscess, a simple lipoma, and so on.

Most clinical cases can be diagnosed through a properly taken history and a thorough clinical examination. In the admitted patients, many investigations may be required. It is a clinician's job to decide the most relevant and appropriate diagnostic tests that may help diagnose the illness. In the current environment of economic constraint, services must be distributed equivocally and ethically. So if you spend a large amount of money on the investigations of a patient, some of which may not really be needed, then you may be compromising the availability of funds for another needy patient. This is of particular relevance to developing economies where a doctor should taken extra care in ordering an investigation, as a doctor's orders are taken quite seriously. So, despite dire economic conditions, the family may pool in all their residual resources to comply with what the doctor ordered. One daughter was willing to sell their home, to take her mother for investigations to US at the advice of her family doctor in Pakistan, until she was told by some sensible physicians and family members that it was not a feasible proposition as her mother was terminally ill.

Many investigations currently in vogue in the UK are carried out because of defensive medical practice. For instance, an MRI head scan is routinely arranged in a case of unilateral tinnitus. The majority of these scans are normal, but they are certainly draining upon the resources; however, since it is feared that an odd case may turn out to be a case of acoustic neuroma, the practice is considered valid. Acoustic neuroma is a slow growing benign tumour which is best treated conservatively. So is there justification for ordering an MRI in every case?

FNAC is a routine investigation into lumps and bumps. It is extremely helpful. It carries minimal risks of complications. But is it really needed? That question can only be made by the serving clinician. So any invasive procedure, even if apparently minor, should be carefully thought over before being carried out. Any procedure can cause harm. A routine myringotomy in a unilateral case of conductive hearing loss was carried out by a surgeon, who was not prepared to meet this challenge on this particular occasion. He punctured the ear drum with a myringotome as , with a rush of blood pouring out of the ear. Panic broke out and with great effort the haemorrhage was stopped; then the patient was scanned, only to show a glomus juglare sitting in the middle ear. This is a good example of where the clinician who initially saw the patient failed to arrange a scan in a unilateral case of conductive hearing loss or indeed note the tell-tale clinical signs of a blue drum, so pathognomonic of vascular middle ear pathology.

In ordering or performing a procedure on a patient, one must always keep the principles of beneficence and non-malificence in mind.

As a resident doctor, it is your job to do the basic chalking and order routine investigations, etc. Once a diagnosis is made, it is usually the seniors who will determine the next course of action. It is, however, necessary that, as a junior member of the team as FY1 or FY2 or a resident, you may feel the patient may require a second opinion, or indeed should be referred to a different specialty. Since you are the foot soldier in the field, you may be the best judge in a given situation, but discuss it with your immediate senior and carry out timely referral to a relevant department. It is vital to note that a delayed referral is akin to no referral at all, particularly in an urgent situation. For instance, a patient with a bleeding duodenal ulcer may not wait for a senior to visit to decide the next line of action. As a junior, your observations and your clinical judgment, with timely referral to a GI team from, say, a general medical Ward, could easily save a life.

Sometimes a hospital may not have those services available to its inpatients and transfer may be required. Guidelines are available for such an action in any health service. It is not as simple as it sounds. The junior doctor who normally has to negotiate the transfer must keep his seniors full informed of the plan of action; a hasty or unprepared transfer may be as dangerous as a delayed planned transfer. A child requiring special care for acute respiratory disorder, an elderly person suspected of a pulmonary embolism, or an obstructed hernia may all need proper and timely transfer to another service.

There is much to say in praise of ambulance services in many developing countries. However, there is a lot that needs improvement, as volunteers have neither the training nor the equipment available for transfer of patents from the scene of an accident. They are often seen carrying the injured patients literally holding his hands on one side and feet on the other, with the body hanging freely in the middle as in a hammock. This is totally contrary to the principle of trauma support systems, as such a transfer would certainly compromise the spine.

The transfer of a sick patient from one hospital to another has to be a coordinated activity, between the sending and the receiving team. Regular contact must be maintained at both ends, and papers duly signed on transfer from one place to the other. A nurse or paramedic should accompany the patient. In some acute situations, a doctor may have to travel on the ambulance with the patient.

The importance of keeping the family fully informed of any action cannot be overemphasised. The next of kin, or an attending family member, must be taken into confidence for the present condition of the patient, and interventions planned or a transfer or referral to a different service if required. If the patient is in full control of his senses, all such information can be shared with the attendants with his informed consent.

Data protection is one of the basic ethical duties of a doctor. It is the covenant of trust which makes the bond between the patient and his doctor so special. It must not be breached. So, all the information you may have gathered in your interview and clinical care must be secured in the Clinical Data Archives (CDA). Access is only allowed to authorised personnel. You may not transfer data onto a source such as a disc or USB in the country of your practice; in the NHS, one is not allowed to use personal USB sticks on the computers. Instead, the IT department would issue an encrypted USB for use in such computers. Not long ago there was a major story in the British national media when a certain employee lost on public transport a disc carrying large volumes of confidential data!

Finally, the factor of time management. Inpatients is busy service. An intern on call may have to serve many departments and numerous wards, as is the practice in the UK at present. It can be strenuous and time consuming. It is therefore necessary that time management be part of the training of a young physician. Each patient should receive full attention, but not at the cost of neglecting other jobs. So efficiency in managing patients is an art that every youngster must cultivate, acquire and polish. It may be of use for many long years.

7.7 Structured, and Simulated Patients

Direct contact of a medical student with a live, actual patient for teaching purpose is ideal. It is the usual practice in most institutions the world over. However, now substituted with structured or simulated patients for many reasons, mainly ethical considerations, etc., many teaching institutions are now employing actors, or subjects who are properly trained to play the desired role of a patient. The following illustrations are commonly used:

1. Programmed patient is a “normal person who is trained to assume and present, on examination, the history and neurological features of an actual patient in the manner of an actual patient”

2. Standardised patient is an individual with or without disease who portrays as a patient for the purpose of clinical teaching

Many institutions are using these substitutes in the demonstration of clinical skills. Beginning with the interview and history taking, through the clinical examinations relevant to a given clinical scenario, according to a predetermined subject, topic or system, finally arriving at a diagnosis.

Many actors become masters of the art after they have been trained by the master tutors in a clinical set-up. They can mimic the signs and symptoms exactly as they would be in a genuine patient. For instance, a programmed patient for appendicitis may point out the pain in the right iliac fossa, and, on clinical application of the digit by the student on McBurney's point, he may groan and show matching facial expressions as one would expect in a case of appendicitis. Muscular guarding and rigidity are also subjective though physiological and precautionary in a true case, and can also be mimicked by these actors.

Cantillon et al. (2010) concur that simulated patients (SPs) are widely used in medical education yet little is known about how individual schools recruit, develop, use, evaluate and maintain them. Opportunities for sharing the development expertise and materials among institutions are not often utilised.

It is indeed a valid concern, as discussed later. So Cantillon and colleagues believe that, in order for different SP programs to learn from each other, there needs to be some basis for establishing meaningful comparisons.

Therefore in 2006 the Association of Standardized Patient Educators (ASPE) piloted an instrument for survey to facilitate comparisons of SP educational practices in different institutions. Belgium, Ireland, Scotland and the Netherlands participated in this study. Key SP contacts were identified in each medical school. Contacts were asked to complete a 49-item questionnaire developed collaboratively between ASPE and the authors. Of the participants, 86 % responded.

After comprehensive evaluation, debate, discussion and analysis, it was noted that considerable differences existed between these four countries in terms of their approach to developing standardised patients, as well as assuring the quality of their performance.

It was also inferred that the employment of simulated patients as a tool of education is indeed an expensive practice. The worrisome factor was that there was little evidence of resource sharing between different centres. Obviously it would be best if the facilities could be shared between different teaching centres, at least in the same city if not country. Who can disagree with that observation, particularly in these days of economic constraints?

There is a clear need to facilitate closer collaboration between centres in developing and quality assuring, and indeed sharing the resources.

Questions are being raised in some quarters as to the use of structured patients, particularly in higher qualifying exams. In the exit exam for MRCGP, such patients have been suspected to show bias. A genuine patient may reflect his feelings truly, but an actor is after all an actor! So quality assurance and removal of bias need to be practiced.

7.8 Teaching in the Operating Rooms (OR)

Surgical skills require long and continuous training in order for one to become an artful surgeon. The conventional way of teaching surgical skills to medical students is through observation for the initial clinical years. This is then followed by allowing a student to scrub up and assist by standing next to the surgeon, watching each step closely. Rarely may he be allowed to hold a speculum or a retractor to get a real feel of the action.

The best way to impart surgical education is through surgical workshops. As a medical student, such workshops may not be required, but as a resident and later as a dedicated surgical candidate, nothing can beat the practical experience of attending various surgical workshops.

Beginning with the basics like sterilisation and scrubbing techniques to the application of knots and sutures, these workshops can go on to become increasingly more complex technically. For instance, a surgeon wanting to specialise as an otologist must attend several temporal bone workshops before getting the real feel of the intricate anatomy of the middle ear.

Currently, all major institutions run such surgical skills workshops at their premises, and some are often arranged in specialised centres. Many years ago, Zaidi arranged at Dow Medical College, Karachi a hands-on workshop on surgical knots through the renowned suture material manufacturing company called Ethicon. Many practicing surgeons attended this workshop and requested regular follow-ups to learn the fine art of suturing. Ethicon have published a manual in this respect, which can be used as a self-teaching manual by surgical fellows.

All surgical students should attend an ATLS workshop. It is highly educational, practical and fundamental.

Sutton and colleagues have described a growingly popular strategy for practical training of surgical trainees. They mention that virtual reality (VR) simulators may have a role in the assessment of trainee abilities independent of their role as instructional instruments. They piloted a course in flexible endoscopy to surgical trainees who had met Accreditation Council for Graduate Medical Education endoscopy requirements to establish the relationship between metrics produced by a VR endoscopic simulator and trainee ability. An introductory didactic session was followed by the faculty instruction to senior residents for upper endoscopy and colonoscopy modules on the CAE endoscopy virtual reality.

It was defined at a trainees meeting that all proficiency standards were met in basic endoscopic procedures on the simulator. A subjective course evaluation demonstrated that the course improved learners' knowledge of the subject and comfort with endoscopic equipment. Within a VR-based curriculum, experienced residents rapidly achieved task proficiency.

The authors believe the resultant scores may be used as simulator guidelines for resident assessment and readiness to perform flexible endoscopy.

Similar workshops are now routinely carried out in most teaching centres.

7.9 Teaching and Learning in a Busy Clinical Set-Up

Experiential learning and teaching are both essential components of a clinician in an academic set up (Kolb 1984). One has to multitask in many ways. As clinicians our first commitment is to our patients, and as a teacher it is to our students. So how does one mix them up? Well, this is where the concept of experiential teaching comes in handy.

Clinical teaching means combining both aspects together by teaching through patient care. It requires prompt decision making based upon experience, thinking while acting and transferring knowledge and skills while serving the patient.

In a busy academic institution, clinical teaching may not remain confined to the allocated sites only; it may also happen in the corridors, in the hallways, in the seminar rooms, conference halls and of course conventional places like wards, outpatients and operating rooms, etc..

Learning through practical experience is the best and lasting form of learning, and no teacher is better than an actual patient. However, this alone is not sufficient. One needs to analyse, think critically, and learn by going into deeper realms of thinking with a view to problem solving, recording the experience in one's mind and harnessing it in future applications.

Most students have a reasonable knowledge of the clinical basis of teaching and learning, but it is the teacher who determines the level of understanding of an individual by asking a few introductory and then probing questions about the presenting complaints. Signs and symptoms, observing and correcting when needed – the process goes on, throughout the clinical years. It is thus an experiential learning process which eventually brings about the desired outcomes.

It is a traditional as well as contemporary way of imparting education in most clinical set-ups to throw a question to the group. Some react quickly and reply. Others may require a direct invitation. The process usually involves a series of activities resulting in a student, thinking, synthesising his thoughts, critically analysing the scenario, and then responding in a simple but effective way. If the peers and teachers are positive in their approach, even a weaker candidate can, with experience, gain confidence – otherwise he may fall behind. A positive, encouraging and supportive approach can yield excellent results through the process of experiential teaching.

Cynthia Kreger has described the model of experiential teaching by Neher et al. (1992), putting the whole exercise into a practical perspective. They are:

Diagnose the patient.
Diagnose the learner.

- Ask for a commitment. What do you think is going on? What tests may be required?
- Probe for the underlying reasoning. What led you to this diagnosis? What other diagnoses did you consider?
- Teach. Provide positive feedback.

Correct errors.
Teach general rules.
Stimulate reflection. What did you learn today, what surprised, inspired or troubled you about this case? What questions does this case generate for you?

This model is extremely practical and most experienced teachers use it in their clinical teaching with satisfactory outcomes.

A seasoned teacher harnesses his experience to the best advantage of teaching through mental exercise while teaching, or examining a patient, by making a diagnosis in his mind, measuring the learners needs, encouraging, probing, exciting, and involving the students in learning through interaction, enthusiasm, collaboration, motivation and a *desire* rather than a *duty* to learn. The finest of clinical teachers are those who can adjust their level of teaching to match the needs and the level of the students in the learning process.

Clinical skills centres are gaining popularity to give a virtual scene and a feel of active participation and an opportunity to learn through action. Martens et al. (2009) investigated the lack of published studies of effective skills teaching in clinical skills centres, and inspired a study of the student views of the teaching behaviour of skills teachers. They organised focus group discussions with students from years 1–3 of a 6-year undergraduate medical curriculum. A total of 30 randomly selected students, divided into 3 groups, took part in 2 sessions. They discussed which teaching skills helped them to acquire physical examination skills.

The study looked at the students' opinions related to didactic skills, interpersonal and communication skills and preconditions. Students appreciated didactic skills which stimulate deep and active learning. Another significant set of findings referred to teachers' attitudes towards students. Students wanted teachers to be considerate and to take them seriously. This was reflected in student descriptions of positive behaviours, such as 'responding to students' questions', 'not exposing students' weaknesses in front of the group' and '[not] putting students in an embarrassing position in skill demonstrations'. They also appreciated enthusiasm in teachers. Important preconditions included the integration of skills training with basic science teaching, linking of skills training to clinical practice, the presence of clear goals and well-structured sessions, good time management, consistency of teaching and the appropriate personal appearance of teachers and students. The teaching skills and behaviour that most facilitate student acquisition of physical examination skills are interpersonal and communication skills, followed by a number of didactic interventions, embedded in several preconditions. Findings related to interpersonal and communication skills are comparable with findings pertaining to the teaching roles of tutors and clinical teachers; however, didactic skills merit separate attention as teaching skills for use in skills laboratories. In the authors' view, the results of this study should be complemented by a study performed in a larger population and a study exploring teachers' views.

7.10 Surgical Teaching

Most of the discussion on teaching and learning is usually based upon the medical scenarios. One must remember that surgical teaching is part of a syllabus too. As far as outpatient and inpatient teaching is concerned, not much difference exists between the medical or surgical patients, though the latter are more obvious on inspection, while medical conditions may be somewhat obscure, requiring more mental exercise.

In the surgical theatres or operating rooms, teaching takes a totally different turn (Sutton et al. 2013). It is mostly demonstrative and practical, with theoretical discussion as and when needed.

Once again, it is best to gauge the level of teaching needs for a given group of students. Obviously, the syllabus would define the learning objectives for such a posting, but a teacher may need to increase or reduce the level of teaching, depending upon the students' needs.

In most operating rooms, a student or two may be allowed to watch the activity from close quarters, but usually they observe from a close-by observation room, where all activity is telecast through a video link. A student must have the fundamental knowledge of relevant anatomy, physiology and pathology prior to active surgical teaching.

The initial stages of anaesthetising the patient and informed consent are demonstrated by the anaesthetist who also explains the various medicines involved and their mode of action. Obviously a student is expected to possess the fundamental knowledge of pharmacology and therapeutics..

The role of oxygenation, the oxygen curve and the effects of vasodilators, opiates and other relevant drugs are often explained by the anaesthetist to build up the deficiencies in the prior knowledge base.

Surgical instruments can be intimidating. Every physician must, however, learn the basic techniques of holding a knife, a pair of scissors, a conventional surgical knot, a suture, a venesection, and various suture materials employed in a routine surgical intervention. After all, a medic may be called upon to stitch a wound or do a venesection, even in a medical ward.

A master teacher enjoys teaching in the surgical theatre. He plays the part of the maestro conducting an orchestra.

He may have demonstrated the abdominal lump on the ward round, and discussed the diagnosis, but now is the time to actually explore the lump. So he may ask the students to recap the neck anatomy. Demonstration will continue while the patient is being wrapped and prepped for surgery. The position of the patient, position of the anaesthetist, the surgeon's personal location, and those of the assistants are all pointed out to the students. It may be the first time they have seen the live operating theatre, and they may not know the protocol. As a matter of fact, surgical scrubbing should also be demonstrated to the students.

The teacher may discuss the proposed incision, or ask the students about their knowledge of various incisions for thyroidectomy. He may then proceed with the surgery, stopping momentarily to identify an artery or a nerve, or raising a question about the possible outcome of trauma to a particular organ, duly emphasising, of course, the importance of identifying the recurrent laryngeal nerve and its possible implications on the voice and breathing should it be damaged. Applied anatomy is always a part of surgical teaching. The exposure of tissues in a patient is totally different to what they would see in the museums or plastinated bodies.

A good surgical teacher can actually bring the anatomy back to life through the demonstration of various fascia, muscles, nerves, arteries and soft tissues. A sound knowledge of anatomy is an absolute necessity for a surgeon. So, while doing a dissection he may ask the students to name the organs, and provide further knowledge as he proceeds.

Surgical procedures take quite some time, so the process of teaching and learning may not remain confined to the students alone. The discussion between the assistants, and surgeon or the nursing team, or the anaesthetist and surgeon, etc. can also be educational for the students.

If a student is asked to assist in the procedure, he may be asked specific questions about the tissues he is retracting, or indeed to identify the various instruments employed in the procedure, such as a round bodied needle or a specific suture material, etc.

The students must be conscious of the need for discarding sharp objects, like needles, etc. in a specified drum (usually yellow in colour and duly labeled 'for sharp objects only'), linen in a particular location for disposal, and so forth.

Just as for medical training, surgical training follows a well-defined protocol.

Surgical technology had advanced so much in the last few decades that the old fashioned open surgeries, which gave a better learning opportunity to a young student, are now rarely available. Surgery was a skill of fingers and hands, but not so any more. Technological advancements have only just begun. Robotic surgery is now firmly in place and makes intricate surgery on remote areas and brain and vascular tumours possible. Keyhole surgery is a fine art, and a student can see whatever the surgeon does through a video attachment. The expertise only comes with practice and attending hands-on workshops. For an undergraduate student, the challenges are far too many and rather complex in nature. The learning objectives in live surgery can be clearly defined by a surgeon while performing minimally invasive surgery such as a laparocholy or endoscopic sinus surgery. The modern world of surgical skills is transporting a surgeon to a totally different horizon.

Minimally invasive surgery is globally on the rise, but it requires intensive training and employment of surgical skill laboratories, animal models or cadaver dissection to get the hang of it.

The best way to learn the art of minimally invasive surgery is to attend skills laboratories dedicated to such training. Increasingly large numbers of such workshops are being conducted by master trainers. This was duly demonstrated by the study conducted by Hiemstra et al. (2013).

They concur with this, despite the fact that in most teaching hospitals all over the world, skills laboratories have been set up in order to train and assess minimally invasive surgical (MIS) skills. However, there are no generally accepted standards as to what an MIS skills laboratory should look like and how the training should be conducted. Their study was an attempt to develop an international and consensus-based set of quality criteria for a skills laboratory for training MIS. The workers identified three quality domains for the skills laboratory: ‘personnel and resources’, ‘trainee motivation’ and ‘curriculum’. They also devised a list of consensus-based criteria, assigning nine items per domain. Twenty-three recognised experts in MIS rated each item on a 0–3 scale as to level of importance. The most important items per domain were: ‘personnel and resources’, the presence of a box trainer, a laparoscopic expert and the availability of financial resources; ‘trainee motivation’, mandatory training supervised by laparoscopic experts; and ‘curriculum’, the presence of a structured skills curriculum, dedicated time for training and a yearly evaluation of the skills of the resident.

The authors believe that the consensus list designed by them can be used when setting up a skills laboratory, but also for verifying the quality of an existing laboratory. It may then lead to identification of the focus for new developments.

Skill laboratories, however, are not cheap and many developing countries can hardly afford to buy and maintain them. According to Leake et al. (2012), there has been a debate on the feasibility of incorporating minimally invasive surgery (MIS) into surgical practice in developing countries because of resource and training limitations. Their study established the current and desired state of keyhole surgery, training in surgical residency programmes in the Caribbean. They employed the traditional methodology of a survey, though an adapted version of a previously administered questionnaire was issued to surgeons and residents involved in the general surgical residency programme of The University of the West Indies in Barbados, Jamaica and Trinidad and Tobago. The questionnaire was sent to 41 surgeons and 41 residents with a 65 % response rate. Most residents had performed less than 25 basic laparoscopic procedures. Up to 82 % of residents felt they would be unable to perform advanced laparoscopic procedures because of lack of training. The principal negative factors influencing MIS training included lack of operating room time, lack of equipment and lack of preceptor expertise. Both surgeons (83.4 %) and residents (93.4 %) strongly felt that a surgical skills laboratory would be helpful for the acquisition of MIS skills. Both surgeons (85.7 %) and residents (100 %) felt that there was a role for a minimally invasive surgeon in fulfilling training obligations.

The final outcome of the survey showed the basic and advanced MIS experience of residents in the Caribbean was found to be limited. In their view, training and resource limitations were the major contributing factors. A strong desire on the part of surgeons and residents alike for the incorporation of more effective MIS training into the residency programme in the Caribbean was acknowledge by the authors.

This invaluable study duly highlights the acute need and desire of the physicians in the Caribbean Islands to excel. One sincerely hopes that one day, not too far in the distant future, the American University of Barbados may be able to arrange such workshops in Bridgetown and elsewhere through its global visiting faculty stretching from North America to New Zealand and areas in between. The support given by IMI can be highly productive as they have a 15,000 membership of medical professionals, teaching or practicing in many top universities such as Harvard, Columbia, Duke, McGill, Mayo, Einstein, London, Edinburgh, etc.

Education and particularly demonstration of invasive medical and most surgical skills has become routine now, thanks to modern technology. Telemedicine is a field in its own right, and is rapidly expanding to serve mankind across all geographical boundaries.

As one famous scientist said in a televised debate, education must be free of walls and boundaries. The time seems to have arrived. Online courses are now a common feature in many fields. The study published by Eaton et al. (2006) duly highlights the role of an open university in the medical fields.

During the 2004 annual meeting of the International Association for Dental Research, the Education Research Group held a symposium on dental outreach teaching. After a brief introduction, which reviews relevant aspects of the relatively sparse literature, this paper summarises the proceedings, the themes and conclusions which emerged and the research issues which were identified. It aims to describe aspects of current practice around the world and to promote future discussion. Presenters gave details of outreach programmes for dental undergraduates in Australia, Finland, Malaysia (and Southeast Asia), the United Kingdom and the United States (Kreger 2001). From these presentations four themes emerged:

1. Reasons for the introduction of outreach teaching
2. Its perceived beneficial effects
3. Organisational issues
4. Educational issues

The reasons included recognition of the need to educate dental undergraduates as members of 'care teams' in the environments and communities where they were ultimately likely to work and the current shortage of both suitable patients and teachers (faculty) in many dental schools. A wide range of potential benefits and some disadvantages were identified. The organisational issues were, in the main, seen to relate to finance and administration. The educational issues included the need to train and monitor the performance of teachers at outreach clinics and to assess the performance of undergraduates whilst at the outreach locations.

The results concluded that new technology made it easier to teach at a distance and it was possible to create a '*dental school without walls*'. The group recognised that few evaluations of dental outreach teaching had been carried out and that there were many research questions to be answered, including whether it should be a voluntary or compulsory part of the undergraduate curriculum, how long it should last and what type of outcomes should be assessed.

Obviously further research into establishing a professional open university is required, but we have some excellent examples of open universities in the world. The illustrious Open University in the UK has educated thousands of pupils over the last decade or so, thus affording many people excellent opportunities for self-growth as well as employment.

The Open University BBC educational programs are exemplary and provide extensive information in the comfort of your own home. How wonderful is that!.

The bother of going out to a walled city called the university may soon be over. One must, however, hastily admit that those walled cities have a special flavour and a very special role in cultivating a human personality. So, those who can should join the traditional universities, and others can learn equally well through the 'universities without walls and boundaries'. The modern world has many avenues open to a learner. All one needs is a desire to learn!

7.11 Post-surgical Teaching Round and Morning Meetings

Post-surgical teaching is another essential component of medical education. Most surgeons see their patients in the recovery room. The chief resident or a senior registrar would normally do a post-surgical round next day, providing an excellence teaching and learning opportunity. Post-surgical complications are a known entity. The surgeon may find the odd haematoma, or a bleeder, or a bruise, a nerve involvement, etc. which are all excellent teaching focal points.

Explaining the problem to the patient is an art of communication, which by itself is a learning exercise. If the patient requires further intervention, or a return to theatre, this by itself is a great learning experience for the students. The surgeon may explain the possible reasons for the complications, any immediate intervention and long term care, etc. during the post op review:

Why has it happened
What can be the outcome? Immediate or delayed?
What can be done
What should be done
Any follow-up
Any referrals (to other deportments)

These are all the focal points that can be used by the teacher–student interaction, and would be profitable for educational purposes. Once a student sees a post operative complication, say a facial nerve paralysis after a parotid surgery, he will remember it for life.

Medicolegal aspects of an intervention are best taught in lectures or case-based scenarios under medical ethics, but any medical student should fully understand the implications of an iatrogenic trauma or complication. Medical defence is a specialty in its own right, but every doctor knows the fundamental principles of medical defence, and a post-operative complication may be a good focal teaching point to discuss it.

Morning meetings are very helpful in discussing inpatient services and the outcome of overnight emergencies, surgical operations, referral from other units and discussion on a difficult or challenging case.

Such meetings are of extreme educational advantage to medical students. Apart from giving them the real flavour of the inpatient care, it also allows them to ask questions and learn even more than the books can teach. Experiential learning is still the best form of practical teaching, as nothing can be a substitute for the personal, practical, physical experience of a physician or a surgeon.

Then there are morbidity and mortality meetings, which are held from time to time. They are extremely helpful in assessing and auditing causes and effects, as well as for future planning to save morbidity and co-morbidities as well as mortality as much as possible.

7.12 Emergency Medicine. A/E Teaching and Learning

The best place to learn about urgent care is a posting in the A & E of a busy hospital. On a given day or night one may encounter a multitude of pathologies. Anything varying from a head injury requiring observation to an unconscious patient requiring urgent scans, Glasgow coma scoring (GCS) or immediate surgical intervention. A coronary may follow a patient with acute abdominal pain and so on.

Teaching in an emergency unit is a special art. It requires patience and immediate decision making. Prompt and correct history taking is followed by a quick but thorough physical examination, an urgent blood sampling, or an X-ray, an ECG or an urgent call to the relevant doctor on call. There is much action going on for a young medic to observe, absorb and remember for later reflection and application.

An emergency tracheostomy to relive an acute respiratory obstruction, or a pulmonary tap to release a pneumothorax causing a mediastinal shift, can be witnessed in a tertiary care hospital A & E, never to be forgotten by the student once seen.

The fundamentals of acute care such as the CPR and airway management, or setting up an IV line, would have been practiced by most students during their educational workshops and attendance in the skill laboratories. To witness it all happening in front of their own eyes on actual patients is the best learning experience that students can have.

Here is a study which truly reflects the role of emergency units in teaching and imparting skills to medical students.

Woods and colleagues (2013) describe the RAPID approach (Resuscitation, Analgesia and assessment, Patient needs, Interventions, Disposition). It was developed as a road map for managing emergency department patients. It is a mental checklist to help trainees provide comprehensive care, addressing issues in order of priority. Early days for the scheme as the author have not assessed its impact on trainee performance.

This study involved a cohort of 42 clerkship students, divided into 2 batches of matching numbers. They received or did not receive teaching intervention on an alternate basis. Students were assessed through daily encounter cards, a case presentation, a self-assessment form, a pre rotation case (case E), and a six-case short-answer exit examination (cases A–F) with case E repeated. Case E was designed specifically to assess students' ability to provide comprehensive care. Fourteen students participated in focus groups.

It was an interesting study which demonstrated that the batch of students in the intervention group had significantly higher exit examination case E scores (11.67 of 14 vs 10.26 of 14, $p=0.008$) and improvement in their case E scores from pre- to post-rotation (1.82 vs 0.26, $p=0.006$). There were no significant differences in the other outcome measures. Furthermore, the intervention group students made positive comments around analgesia, addressing non-medical needs and counselling on health promotion during focus groups.

The authors believe that students exposed to the RAPID approach at the start of their emergency medicine rotation performed better on the one component of the written examination for which it was designed to improve performance. Students found it to be a useful mental checklist for comprehensive care, possibly addressing the hidden curriculum.

The authors recommend, and we strongly concur with their opinion, that emergency medicine teachers should consider further study and careful implementation of the RAPID approach. It would help the young medics develop a mental plan to execute in practical life as and when needed.

Trauma and cardiac emergencies form the major bulk of a busy A & E. On a given Saturday night, anywhere in the UK, the commonest emergency is either a drunken youth or someone who has been injured during a brawl, or a victim of a road traffic accident. Globally, also, the commonest two causes appear to be trauma and coronary heart disease. Acute management of both these conditions requires a prompt, efficient and calculated approach by the team. This is why the training in A & E has to be perfect, as a good job can save many lives and prevent untoward tragedies, death or disability.

Teaching and learning in medicine are multifactorial. Theory alone is meaningless. Likewise, technical skills without a sound knowledge base are useless. It is the job of the teaching institutions to instil both components in equal measure. This is why didactic teaching is always complemented with practical demonstrations.

Before the advent of the PBL and the skill laboratories, there were always practicals, demonstrations and museums which duly complemented the theory taught in the classroom. What has, however, changed is the core content of the curriculum. It has become trim and slim, but the practical component has become robust. The clinical postings in community, family practice or posting in a busy trauma unit, etc. are fine sources of learning through direct observation. Most hospitals are designed to transfer as much clinical skill as is expected of the young physician to employ in his practical life.

As mentioned before, the process of learning is a lifelong activity. Each day brings a new experience and each passing day makes some previous knowledge redundant, even obsolete.

One of the responsibilities of the supervising agencies is to ensure the smooth transition of a young student into a keen, enthusiastic, active learner when he enters a residency program. The habits acquired in the medical school shall become part and parcel of his personality.

7.12.1 Evaluation Strategies

The subject of assessment and evaluation has been discussed in previous chapters. Here we would like to concentrate on student evaluation in a clinical setting. Each student has to go through a learning process, acquiring knowledge and skills to solve the patients' problems, and these three areas, namely knowledge, skills and problem solving, are evaluated through a series of activities.

The written assessment of each student should be carried out as objectively as possible. The person in charge of the process should be fully aware of the goals each student is expected to achieve through a known format of teaching, the core content of material taught and the way it was being employed to teach and train. The evaluator should also know about the level of teaching and training each individual has been exposed to during the unit time of evaluation. Each student and each batch may have different levels of knowledge and skills. The evaluator should evaluate them individually for a minimum standard laid out by the examining council. Obviously those who do better are given higher grades. Some examiners are positive and verbally acknowledge the performance, others are somewhat conservative in their appreciation. This is an individual matter, but a word of encouragement for a good student is always helpful. Some examiners are known to be aggressive, hence feared; others are gentle and polite. Both are honest and fair in their judgement, but the individual appearance of an examiner and his reputation may influence the performance of a student.

The commendation or otherwise of a student is called the narrative. It is of great help to student development, but many examiners find little time to complete it. It may be worthwhile for an examiner to express the strong and the weak points of a student in his report, which would help future planning, assistance or mentoring of an individual.

The evaluation should be carried out as early after the completion of an activity, training or rotation as possible. It is obvious that the human mind can only absorb, assimilate and retain so much. With the passage of time, the memory and cognitive components tend to fade away gradually and slowly. To be fair, the examination should be held soon after a certain task is completed.

There are many ways of recording the performance of each student. Ideally, a standard form should be used by each examiner for grading on identified domains such as knowledge, skills, attitude, divided into subcategories such as patient interviewing, clinical examination, critical appraisal, investigative process, diagnosis, etc. Obviously the examiner observes the students' approach in greeting the patient. Empathy, friendliness, time management and skills in carrying out a given physical examination are other observable attributes.

Each item can be categorised and many more can be added, depending upon the evaluators' meeting, preceding the examination. Uniformity in judgement can only be ensured if the human bias can be eliminated. That is why OSCE is a popular way of student evaluation.

Viva voce is a time tested method of assessment. It has been favoured by most as it allows an examiner to evaluate each student individually on all three domains.

However, it is a genuine argument against the viva voce that some students cannot express themselves, even though they have a strong knowledge and skills base. The other negative factor is that of human interaction. Some examiners could be intimidating and biased. It is standard practice in many developing countries, where students are often targeted by unkind examiners in a viva voce. It must be condemned.

7.12.2 The Liaison Committee on Medical Education

This is an official body in the USA which is responsible for monitoring the activities of an institution regarding student performance and identification of any deficiencies to meet the national standards.

An essential component of medical education is obviously to ensure that the students, faculty and administration are all fully aware of the needs of the population and their reflection in the curriculum taught. Such systems are therefore put in place to monitor and evaluate the programs and to make sure that the curricular objectives are met by the students within a stipulated time.

The three elements involved are:

1. Students
2. Faculty
3. Administrators

The students follow the curriculum and guidance to accomplish the desired objectives, compounded with self study, with a view to achieving the desired learning objectives in knowledge as well as skills to become competent enough to understand and apply the knowledge and skills thus gained.

The faculty needs to teach, supervise, monitor and identify any deficiencies or gaps in the students aiming to achieve those objectives.

The curriculum managing authority verify that the learning objectives within a curriculum are not beyond the reach of students, and see to the successful achievement of those objectives in a given time.

To monitor student performance the LCME specifies the type of clinical conditions required and modifies the requirements as per the needs of the students during the process of learning. The medical school or institution can choose the system of imparting education to achieve the given objectives. However, the main emphasis is laid upon the content and the subject matter which must be incorporated through clinical conditions and patients either through a central program or an individual clerkship, as defined in the curriculum.

The curriculum committee identifies the common conditions seen in a community, such as asthma or road traffic accidents. The school must ensure the students encounter such clinical conditions in their individual postings, or in a community set-up or an affiliated clinical service.

It is also necessary that apart from learning to manage such clinical conditions which are approved and chosen to be taught, the student involvement in each case and the clinical set-up in which a given condition is desired to be taught are also monitored. For instance, RTA is best learnt through direct observation and involvement of the student by working in an A & E. Likewise, a community oriented problem such as asthma may be best managed in a family practice, where the student may be involved in arranging the necessary investigations to confirm a diagnosis as well as management if it is a case of status asthmaticus. It may also be taught in an acute respiratory care unit by means of an outpatient or an admitted case.

The job of the supervising team does not end here. They should also keep a close watch on the students' achievement of the desired objectives through a tracking system. The tracking system allows the students to record the activities performed and the results of an activity done, as well as the progress of a patient with time. This record keeping during studentship is an excellent way to impart this practice as second nature. They will employ this trait during their residency programs.

Regular and periodic discussion with the supervisor and the faculty should help monitor and improve the student performance. If a student finds it hard, the supervisor can duly adjust the needs to enable the student to match up with the other cohorts.

The use of structures and embedded patients is quite helpful in situations where the teaching faculty may not be able to expose the students to certain common clinical conditions.

LCME wants the students to learn about those common conditions which are best described as 'core issues' in a particular teaching set. The LCME duly emphasises active monitoring of each student who has been satisfactorily exposed to such core conditions. Such clinical experience in the early days forms the basis of satisfactory outcomes during the practical life of a student. It is necessary that shortcomings in a student or lack of facilities to obtain satisfactory levels due to shortages or unavailability is duly addressed through different means and measure.

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http://www.lcme.org/new_standard_ed-19-a.htm

Different Teaching Models 8

8.1 Community Oriented Medical Education (COME). An Afro-Asian Model

One of the most innovative and highly fruitful systems of medical education is called the Community Oriented Medical Education or COME. It has gained huge popularity in many African and some Asian countries.

It has numerous supporters and a few opponents. However, nobody can deny its utility in certain special circumstances and certain nations.

During the discussion on curriculum development, it was mentioned that a curriculum should meet the aspirations and the needs of the community and the nation.

The basic health of a common citizen in many countries in Africa, Latin America and parts of Asia is so pathetic that not even clean water let alone preventive measures or therapeutic care are available to all and sundry. Yes, there may be a few pockets and a few citizens who may benefit with the support of international agencies like the WHO or UNICEF, but majority feel far below the poverty line.

Many TV channels show pictures of children in parts of Africa, where they have to walk miles every day to fetch a pail of water. In many other parts, children of school age are seen scavenging the rubbish heaps and garage sites for a piece of metal, a piece of glass, some cardboard or anything else recyclable which they can find to sell to feed themselves.

The world is a cruel place indeed. In the war-torn areas of the Middle East, Afghanistan and now parts of Northern territories of Pakistan, an unbelievable sense of poverty, annihilation and untold misery are witnessed each day.

In such circumstances, where even daily survival has become difficult, one can hardly think of medical education. However, only in 1995, things were different in many of these regions.

WHO had noted the need for a change in some parts of Africa and in Pakistan and decided to conduct a pilot study to implement an innovative principle of medical education.

S. Zaidi, M. Nasir, *Teaching and Learning Methods in Medicine*,
DOI 10.1007/978-3-319-06850-3_8

It was based upon the principle of extending health care to the families in the communities, in health as well as in disease.

Community Oriented Medical Education is a philosophy, a principle, a methodology, a technique, which is implemented through various modalities of education. Community Based Learning or CBL is one such way to implement Community Based Education (CBE) and the most potent and effective way of Problem Based Learning (PBL). One should not confuse these terms, particularly COME and CBE. The former is a principle and the latter a methodology, or an approach to reach that objective.

Many people have defined COME in different ways. The simplest of them all is to say that it is an approach to medical education as a whole, as is primary health care to the health system.

It is a holistic approach to the health care of a community, imparting relevant education to the doctors to serve the community at primary, secondary and tertiary levels. The aim of COME is to produce doctors who are conversant and fully cognisant of the local regional and national needs of a given community. They should be able to employ psycho-social and cultural perspectives of the community in promotive, preventive, therapeutic and rehabilitative health care. It should thus encompass all aspects of human life, i.e. from birth to death.

Curriculum and timetable for first and second year

First year							
Introduction to medicine	Cell and genetics	Growth and development	Locomotor system	GI and hepato-biliary tract	Nutrition	Blood and homeostasis disorders	
5 weeks	4 weeks	5 weeks	8 weeks	6 weeks	3 weeks	5 weeks	2 weeks
Second year							
CVS	Respiration		Reproductive health, GU system	Endocrines	Neurosciences		
6 weeks	4 weeks	4 weeks	5 weeks	8 weeks	7 weeks		

COME met a lot of challenges as deans and principles, who were excellent doctors but not necessarily medical educationists, got confused with the term Community. Many presumed that the whole exercise of COME was based upon producing doctors to work as non-specialised, general duty doctors suitable for rural settings only. That was naive. One particular principle actually forced himself to go to such meetings where planning for COME was discussed, only to ridicule it. Another allowed the exercise, but passively. Change is always challenging, and many position holders got it wrong in Pakistan in the 1990s and failed to come up to expectations.

The modus operandi of implementing COME is simple and time-tested. The only innovative element is that the traditional curriculum of Mr Flaxner was duly challenged and duly dispensed with. It was much too bulky and irrelevant for a particular task. COME adopted a fresh looking curriculum, comprising various modules duly integrated, based upon the bodily systems rather than individual organs. Some people also liked to employ 'Themes' such as pain and shock, etc. The majority of COME experts preferred to employ the systems as it also suited the PBL methodology.

It is the job of the curriculum committee to determine the systems they want to teach during a specified academic year. The modules are integrated both horizontally and longitudinally with other basic subjects. All the chosen modules run in blocks. A block is a form of concentrated study on a given subject in a given time. The curriculum is designed while keeping the level of training and education of the faculty and students in mind.

Early modules are fairly elementary, such as introduction to medicine or health services, etc. but, as the students get accustomed to the systems, increasingly complex modules are introduced. There is always a difference of opinion amongst the faculty on the subject of prioritisation. Each subject specialist insists on emphasising the importance of his subject. This is why it is best not to give the sole authority to a subject specialist but to distribute it equally amongst all members of the faculty.

The principles of pedagogy have been discussed elsewhere in this book. PBL is a methodology employed in COME. Suffice it to say that COME is a form of andragogy, employing the underlying theories of adult learning. They can be summarised as a study which the students find relevant, enables them to build on previous experiences, is interactive and involving, is problem-based and problems oriented, is tailored to suit their needs enabling them to learn at their own speed and in their own time, is practical and innovative, targeted and goal oriented, resulting in self fulfilment and personal success, etc.

PBL is thus very easily accepted by mature students. Younger students find it somewhat challenging and intimidating.

Apart from PBL, the other modus operandi employed in COME is CBS. It should have clearly defined objectives, which should be planned and organised, integrating all aspects of the curriculum, and should be popular with the faculty, involving each and every member on equal terms. It also must use interactive, non-passive ways of imparting education. It should benefit the community, the nation and the world at large through excellent service.

8.2 Community-Based Education (CBE) Is Taught Through Community Based Learning (CBL)

This is a process which brings the students quite close to the community they eventually serve. The process is interactive, self directed and extremely exciting. Since the members of the community are a source of education, and because a long term relationship develops between both parties, a profitable outcome is the eventual result in most situations.

CBE is a highly innovative way of educating young medics through direct contact with the teachers in the community, members of the community, leaders, representatives of other health providers, managers, time keepers, gatekeepers and the people who needed the help. In other words, it is a learning activity which is conducted outside the traditional tertiary care hospital settings, in a rural, semi-urban or urban environment.

The following study duly highlights the role of CBE in developing countries, where communities are still the major stakeholders as health beneficiaries.

In the global club of nations, Bangladesh is a relatively new country. Since its independence in 1971 it has leaped and bounded forward in nearly all fields. Formerly part of Pakistan, it had employed the same methodologies as the parent country. However, with a forward looking leadership in medicine, they have marched on. In this report Khan and Hussain, seasoned medical educationists and planners, reiterate that the curriculum represents the expression of educational ideas in practice, although it needs continuous modification varying in different geographic locations. They describe a step-wise curriculum in ophthalmology based upon the principles of CBE, for undergraduate medical courses in Bangladesh in a trial conducted from March 2007 to February 2008 at the School of Public Health and Life Sciences, University of South Asia, Banani, Dhaka.

They describe their modus operandi, which included two iterative rounds and a workshop. Questionnaires of round I included simple queries such as “What are the eye diseases with overall knowledge of their management one MBBS physician should acquire”, followed by a list of eye diseases and topics for expert opinion. The response was collated. Iteration round II was “How much a MBBS student should have percentage of knowledge, attitude and skills on each topic while being taught”. The response was collated and presented to a panel of expert ophthalmologists for discussion and validation. In round I Delphi, 400 (62 %) out of a total of 641 ophthalmologists were randomly selected, dividing them into categories of Professor 22, Associate Professor 12, Assistant Professor 26, Consultant 27, ophthalmologists working in NGO 56 and ophthalmologists in private sector 257. Sixty (15 %) responded with an opinion. In round II, 200 (31 %) including 60 from round I, were selected randomly but proportionately as before. Forty-five (22.5 %) responded with an opinion.

After a fairly good study, the results and opinion of respondents were presented at a workshop attended by 24 (80 %), out of 30 invited expert ophthalmic specialists for discussion, criticism, opinion, addition, modification and finally for validation (Khan and Hussain 2012).

The authors concluded that, based upon the opinion of the respondents, literature review and the epidemiological study of eye disease in Bangladesh, and evaluations the current ophthalmology curriculum, they justified the development of a community-based ophthalmology curriculum for an undergraduate medical course.

Such an effort must be duly applauded and this CBE course could well be replicated in other neighbouring countries with matching disease patterns.

In fact, most medical educationists believe that teaching hospitals may not really be the best place for imparting education to modern medical students. This concept is based upon the changing needs of the time. Most authorities and health planners believe the future doctor should be trained in the community as the majority of the students go into family practice. Only a small percentage will go into hospital practice and very, very few into academia.

Much debate has already gone into the good and bad aspects of PBL. However, in the context of COME, let us reiterate the subject once again.

The greatest debate on PBL is that of the integration of various disciplines into a problem. It is indeed a misconception that PBL must be constructed by a multitude of subject specialists in a workshop or during a session convened only for this purpose. That is an option, but, more often than not, a gathering of this sort is difficult to arrange in a busy academic calendar. Besides, integration should be student-centred, student-triggered and learner-oriented. Furthermore, the process of integration does not mean the integration of the curricular subjects only, but also the integration and consideration of psychological, social, economic and behavioural factors.

Problem writing is an art. It is cultivated through regular exercise. The department of medical education, amongst many other organisations, should allocate some time for faculty training in problem writing exercises. It is not a one-off thing but an ongoing activity. Many faculty members like it and volunteer to develop the problems in their spare time. Such data should be saved in the data bank to be harnessed from time to time.

The most interesting thing about an innovative curriculum is that it is a dynamic entity. Each day brings fresh information, fresh problems and relevant answers to solve them.

Medicine is evolving every day and it is not humanly possible to keep pace with the rapid development in nearly all fields. This is why modern scientific gadgets have all but taken over the role of storing data, to be made available at the click of a button or simply moving a finger across a touch screen. It is vital that each one of us involved in education and health care be fully conversant with at least basic – if not advanced – IT.

Each day, more and more hospitals and health services are becoming paperless. It is only a matter of time before the customary paper files for maintaining patient data become obsolete.

In a way, it is a blessing in disguise, as all those who work in the hospital may vouch for the general untidiness of the paper files, with papers falling all over the place and data either misplaced or missing.

Regrettably, though, one cannot guarantee the safety of all patient data on IT systems either. Not long ago a computer compact disc (CD) carrying confidential patient data had vanished in England, creating much confusion and chaos amongst the health authorities.

8.3 Examples of Case-Based Scenarios in the COME Curriculum

Module for 1st year
Cell
Structure and function
Its development
Its adaptation
Its metabolism in health and disease
Molecular biology and fundamental genetics

General Instructional Objectives

Cell morphology
Cell metabolism
Cell division and cell injury
Effects of disease on the cell
Basic facts of human genetics
Molecular biology

Special Instructional Objectives

Discuss and explain the effects of disease on human cell
Discuss and explain some common genetic diseases in the community.

Instructional Strategies

Lectures
PBL sessions
Tutorials
Group discussions
Case based scenarios. Clinics
Skill laboratories
Histopathology laboratories
Assignments

Learning. Resources

Books
Journals
Models
Museums
Library
Internet

Evaluation
Summative. At the end of a module or block
Formative. End of term

Evaluation
Summative
Student evaluation
Continued assessment after tutorial – 20 %
End of term 10 %; final examination 70 %

Evaluation
Module and block evaluation
Both continued and at the end of term

Case Based Scenario: PBL

A 2-year-old baby presented with bilateral hearing loss
Global developmental delay and a history of family deafness

Tasks

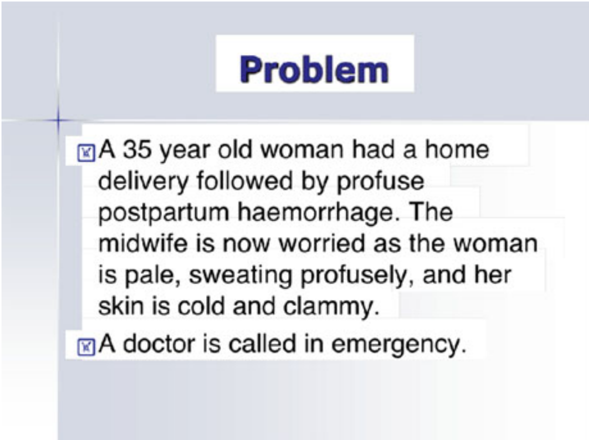
Discuss the effect of minor trauma on cell
Describe the healing and repair process
Describe the normal genetic code
Describe the inheritance of Downs' syndrome
What are milestones? What could be the causes of a delay?
What could be the cause of hearing loss?

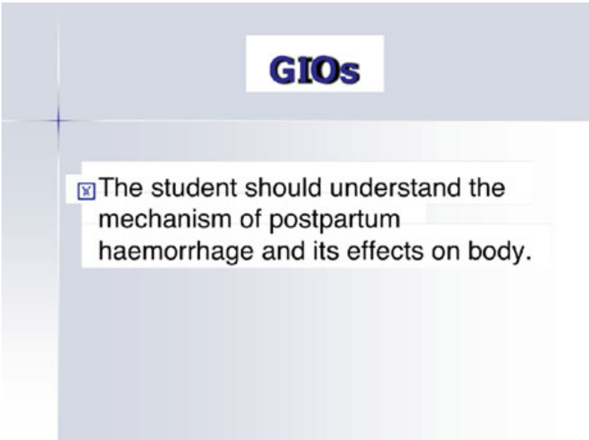
Faculty

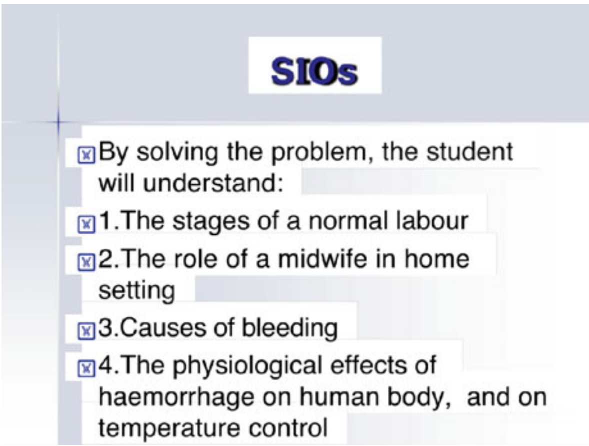
Anatomist
Physiologist
Pathologist
Geneticist
Paediatrician
Family physician

Setting

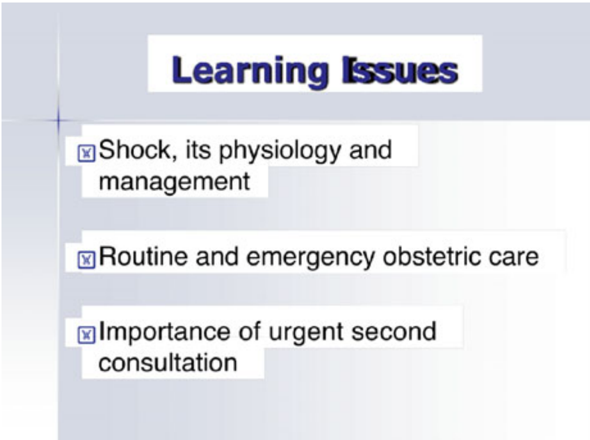
Family practice
Community health centre
Specialist clinic, tertiary care hospital, etc.

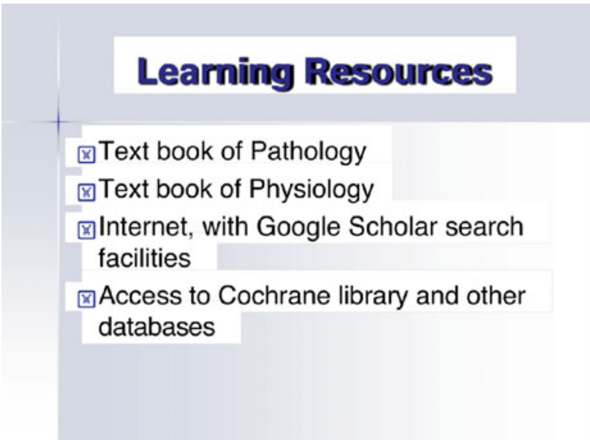

Problem
A 35 year old woman had a home delivery followed by profuse postpartum haemorrhage. The midwife is now worried as the woman is pale, sweating profusely, and her skin is cold and clammy.
A doctor is called in emergency.


GIOs
The student should understand the mechanism of postpartum haemorrhage and its effects on body.


SIOs
By solving the problem, the student will understand:
1.The stages of a normal labour
2.The role of a midwife in home setting
3.Causes of bleeding
4.The physiological effects of haemorrhage on human body, and on temperature control


Triggers/Cues
Labour, excessive vaginal bleeding
Cold and clammy skin of the patient
Pallor and anxious look etc.


Learning Issues
Shock, its physiology and management
Routine and emergency obstetric care
Importance of urgent second consultation


Learning Resources
Text book of Pathology
Text book of Physiology
Internet, with Google Scholar search facilities
Access to Cochrane library and other databases

GI tract and Hepatobilliary System

Faculty:
Physiology, Medicine, Biochemistry, Community Medicine

GIOs

- At the end of this module each student will be able to understand the structure, function and development of the GI and hepatobiliary system and pathophysiology of its common disorders

SBO/Specific Instructional Objectives

- At the end of this module the student should be able to:
- (a) Explain the development of GI and hepatobiliary system and common congenital abnormalities.
- (b) Draw and demonstrate the structure of GI and HepBil as a whole.

SIO

- (c) Explain the pathophysiology of vomiting, diarrhoea, defecation, illustrated through common ailments.
- (d) Illustrate the structure of the oral cavity and explain how mouth ulcers and oral cancer is caused.
- (e) Explain the structure and functions of salivary glands, and correlate the anatomical and physiological facts underlying the development of disease.

SIO

- (f) Explain the anatomy of esophagus, motility disorders, dysphagia, particularly in benign, premalignant conditions, and and malignancies.
- (g) Explain the mechanism of acid production and acid peptic disease.
- (h) Depict the structure of stomach.

GI Module ctd

- PBL
- Tutorials
- Student led seminars
- Practicals in skill labs
- Clinical ward assignment
- Community assignments

Learning resources

- Last's book of Anatomy
- Bailey's Histology
- Guyton/Ganong's book of physiology
- Harper's Biochemistry
- Robin's/Boyd's Pathology

GI Module ctd

Other resources:

- Lecture halls
- Demonstration rooms/tutorial rooms
- Prosections/dissection/specimens
- Museums/ physiology and biochem labs
- Field and community visits

Module evaluation

- Will be based upon a prepared questionnaire which every student will fill out at the end of the module. Open discussion between faculty and students designed to improve the modules for future.

NERVOUS SYSTEM

PBL Module and CBS

8.4 Case Based Scenario. Concussion

A five-year-old boy fell down from the rooftop of his house, about 3–4 m high. He lost consciousness for a brief while. In A&E he was fully aware and had normal papillary reaction. He had a small swelling on the Rt. temporal region.

Concussion

- Tasks/questions
- Explain what is happening to this child
- Why has he lost consciousness
- What is the realtionship between the fall and unconciousness
- Why does he have a swollen right temporal region

Concussion

- Cues and triggers
- Loss of consciousness
- Swelling of the temporal region
- Normal pupillary activity

Concussion

- SIOs
- By the end a student will be able to:
- 1. Explain the structure and function of brain.
- 2. Describe the protective role of skull and meninges.
- 3. Define neuron and its components and define neuromotor conduction.

Respiratory System

- Modus Operandi:
- 1. Introduction to the course. Lecture by physiologists and physicians (1 hr)
- 2. Introduction to common respiratory conditions tutorial by physio/path physicians (4 hrs)

Resp. System

- Development of lungs, and applied embryology. And anamolies. Models, lectures, tutorials, Audiovisual aids, group discussion. (15-17 hrs)
- Gaseous exchange partial pressure, oxygen transport. Lectures, tutorial, skill labs, resp wards (16 hrs)

PBL

- A 50 yr old man presented with chronic productive cough low grade fever, night sweats and chronic shortness of breath.
- His chest x-ray showed activity in left upper lung. His blood picture was:
- HB 12.5 Gm%
- TLC 20000
- ESR 60 mm

Evaluation

- Continuous assessment 30%
- Short essays 20%
- MCQs 20%
- Viva voce 20%
- Attendance 10%

SIO

- By the end this prob a student should:
- Illustrate the Anatomy of lungs and pleura
- Explain the physiology of resp.
- Disuss the mechainism of secretiotion in resp. tract
- Discuss the physiological explanation of fever and shortness of breath
- Outline the pathophysiology of TB

Evaluation

• Continuous assessment	30%
• Short essays	20%
• MCQs	20%
• Viva voce	20%
• Attendance	10%

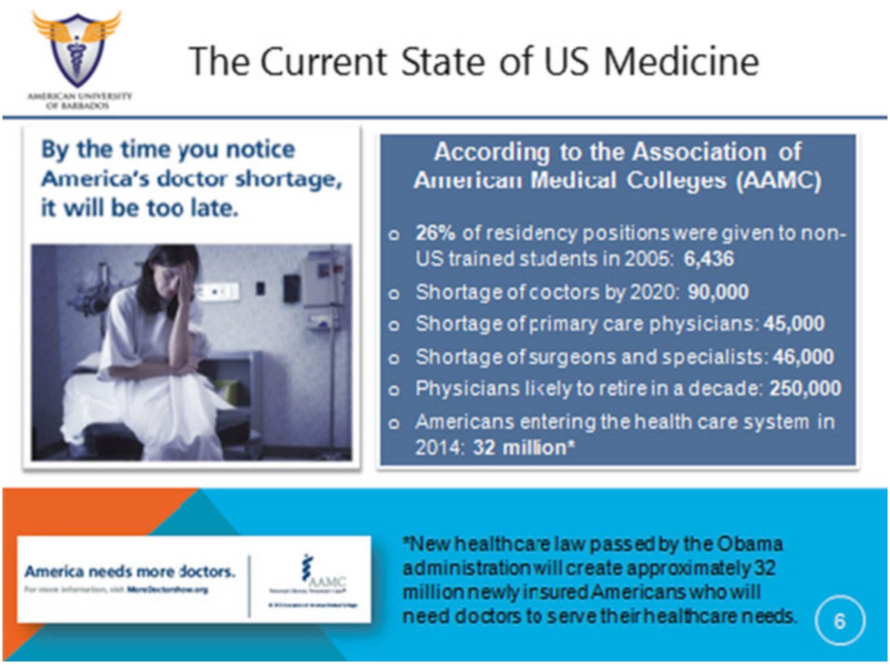
8.5 Medical Education in the Caribbean Islands

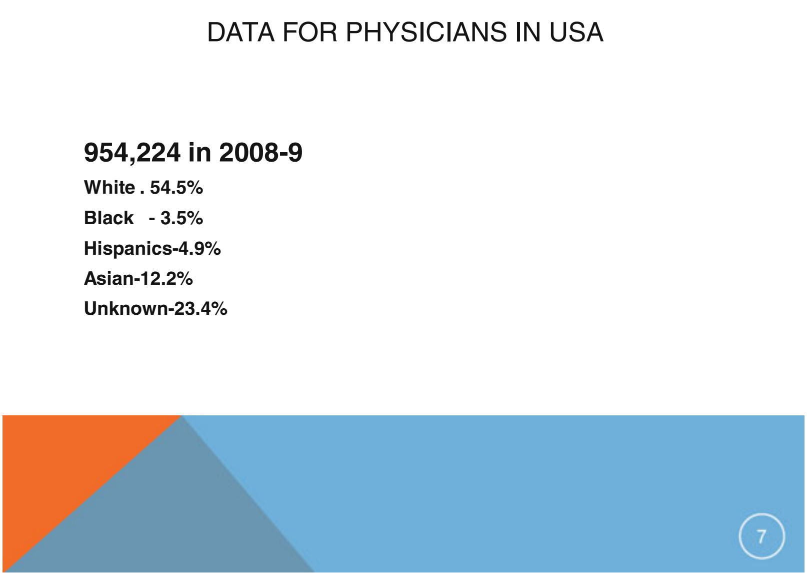
Global needs of medical graduates, particularly in the US and many developing nations like China and India have encouraged entrepreneurs and business houses to invest in medical education by opening several medical schools in their own countries but also in neighbouring islands. Caribbean medical schools are gaining popularity by the day (http://www.anytime.ms/IzyFcqv. Dated 31st July 2014).

New England Journal of Medicine recently published a review article duly emphasising the acute shortage of physicians and nurses in the world. It gives fascinating data about the shortage of services in the world. Even though many medical schools have opened in both developing and developed countries, the number of populations having no access to health care continues to rise. Countries such as Bhutan and Maldives have no medical schools and totally rely on other countries to fulfil their needs. The USA, which has only 4% of the total global population, 8 % of doctors and 17 % of the nurses of the global supply serving the nation, still has massive underserved areas. A new phenomenon called Competency Based Skills is emerging quite rapidly, which may fill in some gaps in the emerging world economies. The idea is to improve upon existing skills and discard the outdated in favour of the latest. China is investing a huge amount of money in opening new medical schools and despatching great numbers of its students to the Western universities to gain the latest knowledge and skills and return home.

USA, Canada and UK have always relied heavily upon the import of doctors and nurses from abroad. One obvious reason was purely economical in nature. Why spend several hundred thousand pounds on producing a doctor if you could obtain one fully qualified and adequately trained doctor from India or Pakistan. The second factor was in fact the acute deficiency in the number of medical schools and the rising needs of these countries. Better education, better health, longevity, rising populations, etc. have always kept the demand and supply ratio in the favour of the overseas doctors.

The following data may reflect the existing situation.


AMERICAN UNIVERSITY OF BARBADOS
The Current State of US Medicine
By the time you notice America's doctor shortage, it will be too late.
According to the Association of American Medical Colleges (AAMC)
26% of residency positions were given to non-US trained students in 2005: 6,436
Shortage of doctors by 2020: 90,000
Shortage of primary care physicians: 45,000
Shortage of surgeons and specialists: 46,000
Physicians likely to retire in a decade: 250,000
Americans entering the health care system in 2014: 32 million*
America needs more doctors.
AAMC
*New healthcare law passed by the Obama administration will create approximately 32 million newly insured Americans who will need doctors to serve their healthcare needs.
6


DATA FOR PHYSICIANS IN USA
954,224 in 2008-9
White . 54.5%
Black - 3.5%
Hispanics-4.9%
Asian-12.2%
Unknown-23.4%
7

DATA FROM UK

Total number of physicians registered with the GMC in UK

252,441 in 2012

UK graduates	**63%**
India	**10%**
Pakistan	**3.6%**
Iraq	**0.5%**
Nigeria	**1.65%**

CARIBBEAN

Currently there are 61 Medical schools in the Caribbean.

Accreditation :

56 are Listed in the
FAIMER (International Medical Education Directory)
Avicenna Directory for Medicine
Caribbean Medical Schools Accreditation committee.
IMED (international Medical Education Directory.

Most American graduates are easily absorbed into their respective university affiliated hospitals, but the hinterland of the Midwest and the far flung areas of Arizona, etc. remain fairly deficient in the provision of health workers. This is why the current system of postgraduate training gives extra benefits and perks to those foreign qualified graduates who are currently on a J1 visa and have to return home after a 7-year period. They can avoid being sent home if they go out to serve in the so-called underserved areas, which in fact may not be far flung regions, simply under served.

It is envisaged that approximately 250,000 primary physicians may be required in the next 5–10 years after the extended health care program is fully operational. Currently, the US medical schools are running at full capacity. Surely many more will come along to fill the vacuum, but this is easier said than done.

Health macroeconomics is a major subject, in which some universities are running masters programs. A reader is advised to look up their web sites for further information. Suffice it to say here that the global credit crunch may not yet allow all these theories to be put into practice – not for a good decade or more. At present the cost of graduating a medical student in US is approximately US$400,000. Many families have to struggle to meet those demands, especially if there are two children going through professional education. No doubt there are bursaries, and student loans, which are available to most but not all. So there is a problem. A time-honoured factor called the demand and supply gap.

The Indian subcontinent has supplied a large number of medical graduates to the US since the 1970s. Prior to then, most of these fresh graduates would go to the UK as their teachers had returned from Britain after acquiring their fellowships. However, with the decline of the British Empire, its qualifications lost their value. The US stepped in as they needed fresh medical graduates and there were lots of them available in the developing countries.

This practice has continued since. However, India has once again grown into an economic giant with brand new health centres and hospitals opening up each passing day. Many international groups have also joined hands with the Indian entrepreneurs to open mega hospitals. Besides, medical tourism has become a thriving industry in India. All these and the pull of the mother country have reduced the entry of Indian medics into the US market.

Pakistan is a different story. With the rapid rise of terrorist activities infesting its lands, not many fresh graduates from even the best institutions can obtain entry clearance to the US. The visa issue is a major reason for these fine doctors struggling to climb the career ladder. The employers find it hard to convince the foreign office that these young medics have nothing to do with the horrible activities going on in their towns and cities. In fact they themselves are the victims of such awful circumstances. However, politicians and the bureaucracy have their own measuring rods for assessing who may be a victim and who may not. So many Pakistani doctors are simply stranded either back home or in other parts of the world and cannot gain entry into the American health system. History confirms that many top universities across the US and Canada have their top positions held by some of the graduates from Dow, KE, and other medical colleges in Pakistan.

The Far East has its own excellent postgraduate setup and hospitals to absorb their graduates. Malaysia is an excellent example, where their universities send their students to the UK for completion of their degrees and training, only to return home to take up the slots already reserved for them. The Malaysian universities are simply the best anywhere. Their deans and professors, their institutions and logistics are easily comparable to the Ivy League universities. This is one major reason why you would not find many expatriates serving in the Western hospital services.

The same applies to Singapore and now China. Finally, the continent of Africa, mainly Nigeria, prefers to send its students and doctors to the UK as British qualifications are greatly valued in their country. Many are, however, looking for opportunities in the US market.

In 2012, the Imamia Medics International (www.imamaimedics.org) signed an MOU with the AUB to support the project through its global fraternity.

IMI is loaded with capable professors, teachers, clinicians, paramedics, nurses and other medical professionals. At the sixth international conference held in August/September 2013 in Toronto, one could clearly see a gathering of stars from all parts of the world. Professors from Emory, Columbia, Duke and Yell. Top consultants from Ireland, England, Europe, the Middle East, India, Pakistan and numerous other places with a huge amount of clinical, practical and teaching experience.

Some of these members of IMI are expected to be the visiting faculty at AUB, which brings in a lot of experience from the North American hospitals to the students at the AUB. It is expected that some of these stalwarts may accept the AUB students in their respective institutions in their clinical years.

AUB has arranged a series of Webinars and seminars for its students. Masters in their fields in the US, Canada, Europe, the Middle East and Indo-Pakistan, as well as New Zealand and Australia, will be invited to speak to the AUB students through the courtesy of IMI. With the heavy visiting faculty on board, AUB could safely boast to be the best institution in the Caribbean to impart education matching with the North American centres. The support of IMI stalwarts is global and opens up new avenues for research as well as development through the multiple facets that this bond has granted to the AUB. One hopes to cash in on this invaluable treasure of human resources as the capacity building and harnessing of the human talent pool for the welfare of mankind through excellent education is one of the prime objectives of the AU--RA-IMI axis.

The next IMI international conference, seventh in the series, will be held in Barbados with the collaboration of the AUB and ERA (Lucknow Medical College and Hospital). It will be held in August 2014 and will be the first conference of global magnitude anywhere in the Caribbean medical schools. It is expected to bring in a large international faculty and clinicians from the IMI family spread over 15 countries. AUB students, along with the faculty, will be helping in the holding of this event.

About AUB The American University of Barbados (AUB) School of Medicine (aubmed.org) is located in Barbados, in the West Indies. It originated from the initiative, support and cooperation of the Government of Barbados and the Ministry of Education to extend a Charter to establish the first Offshore Medical School on this exotic island in the Caribbean. AUB is recognised and licensed by the Ministry of Education.

The curriculum at AUB is structured after the best US and Caribbean Medical Schools. The university provides students with a comprehensive preparation for USMLE Step 1 and Step 2 examinations for licensure in the USA and other mandatory entrance examinations for any other country.

The school endeavours to emphasise ‘student centric’ rather than ‘teacher centric’ training. They view the role of a teacher as a facilitator who helps students 'learn the subject' rather than merely 'teach the subject'. In other words, it is andragogal in approach.

AUB offers two programs of varying duration:

- Comprehensive 5½-year MD program for motivated high school graduates
- 4-year MD program for BSc graduates

Their curriculum is on a par with the best that the US medical schools offer. Their professors are experienced and well qualified to guide you throughout the course. Their excellent student–teacher ratio ensures that each student gets the individual attention he requires. Practical education is imparted through hospital integrated programs and clinical clerkship rotations.

AUB aspires to produce medical graduates who are emotionally and culturally sensitive and have world class competence, so that they can be valued and respected healers and responsible citizens anywhere, they choose to be.

The aim of the university is not only to produce doctors with a good clinical knowledge and matching skills, but also to instill in them ethics and values by which they can treat their patients with a human touch. AUB seeks to provide world class medical education with cutting edge equipment and pedagogy in an environment which fosters appreciative enquiry, human sensitivity and collaborative research aimed at reducing human suffering and pain.

The curriculum is designed to educate and provide students with the knowledge, skills and attitudes necessary to practice medicine. The first five semesters concentrate on the basic medical sciences – including anatomy, biochemistry, physiology, microbiology, genetics, pharmacology, pathology and community and behavioural science. Concepts and skills necessary to manage clinical illness, to understand the socio-cultural issues in medicine and to be well grounded in the ethical- and evidence-based medical practice are introduced early and explored in depth as the curriculum progresses. Emphasis is placed on prevention, diagnosis and management of disease states and on the systematic application of these concepts to organ specific diseases on the one hand and to use them to promote health on the other.

The quality of teaching is excellent. Here is an illustration of a module taught in MD-4

8.6 Module on Endocrine Pathology

Sample Questions with one or more than one correct answer (*Courtesy M H Bukhari Faculty-AUB*)

Q NO.1. When progressive enlargement of a multinodular goiter causes symptomatic tracheal compression, the preferred management in otherwise good-risk patients is:

A. Iodine treatment
B. Thyroid hormone treatment

C. Surgical resection of the abnormal thyroid
D. Radioactive iodine treatment

Q NO.2. The most precise diagnostic screening procedure for differentiating benign thyroid nodules from malignant ones is:

A. Thyroid ultrasonography
B. Thyroid scintiscan
C. Fine-needle-aspiration biopsy (FNAB)
D. Thyroid hormone suppression

Q NO.3. The preferred operation for initial management of a thyroid nodule which is considered suspicious for malignancy by FNAB is:

A. Excision
B. Partial lobectomy
C. Total lobectomy and isthmusectomy
D. Total thyroidectomy

Q NO.4. Advantages of total thyroidectomy for management of papillary carcinomas of the thyroid larger than 1.5 cm. include:

A. Possibility of using radioactive iodine postoperatively to identify and treat metastases
B. The ability to use thyroglobulin levels as a marker for recurrence
C. Lower overall recurrence rate
D. Lower risk of hypoparathyroidism

Q NO.5. Which of the following statements about follicular carcinoma is/are true?

A. It presents at a later age than papillary carcinoma
B. It disseminates via hematogenous routes
C. It is the most common type of well-differentiated thyroid carcinoma
D. Extensive angioinvasion portends a poor prognosis
E. Follicular carcinomas are frequently multicentric

Q NO.6. A familial form of medullary thyroid carcinoma (MTC) should be suspected whenever:

A. The tumour is multifocal
B. The tumour is bilateral (foci of tumour are present in both thyroid lobes)
C. Pathologic examination of the resected thyroid gland reveals the presence of C-cell hyperplasia in areas of the gland adjacent to foci of MTC
D. All of the above.

Q NO.7. All of the following are components of the MEN type 2B syndrome except:

A. Multiple neuromas on the lips, tongue, and oral mucosa
B. Hyperparathyroidism
C. MTC
D. Pheochromocytoma

Q NO.8. MEN 2A and MEN 2B syndromes are associated with germline mutations in:

A. The p53 tumour suppressor gene
B. The H-ras gene
C. The N-myc gene
D. The RET proto-oncogene

Q NO.9. Which of the following are true concerning islet cell neoplasms of the pancreas in patients with MEN type 1?

A. Islet cell neoplasms in patients with MEN 1 are characteristically multicentric
B. The most common islet cell neoplasm in patients with MEN 1 is gastrinoma
C. Islet cell neoplasms in patients with MEN 1 may be malignant
D. All of the above

Q NO.10. Which of the following statements about the differential diagnosis of hypercalcemia is/are correct:

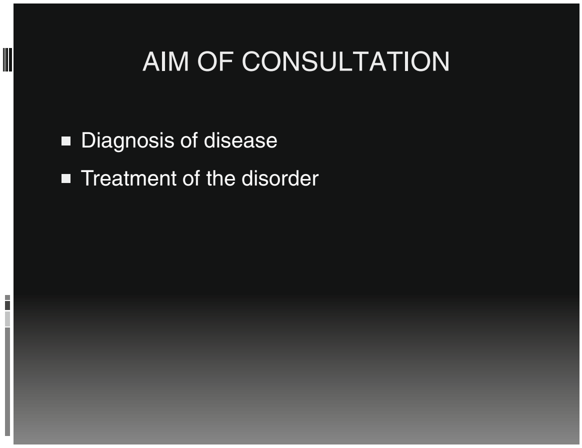
A. Malignant tumours typically cause hypercalcemia by ectopic production of parathyroid hormone (PTH)
B. The diagnosis of primary hyperparathyroidism is supported by these serum levels: calcium, 10.8 mg/dL; chloride, 104 mmol/L; bicarbonate 21 mmol/L; phosphorus, 2.4 mg/dL; elevated parathyroid hormone
C. Familial hypocalciuric hypercalcemia is distinguished from primary hyperparathyroidism by parathyroid imaging
D. Although serum albumin binds calcium, the measured total calcium value is usually unaffected in patients with severe hypoproteinemia
E. Thiazide diuretics are a good treatment for hypercalcemia and can be given to patients with apparent hypercalcemia of malignancy

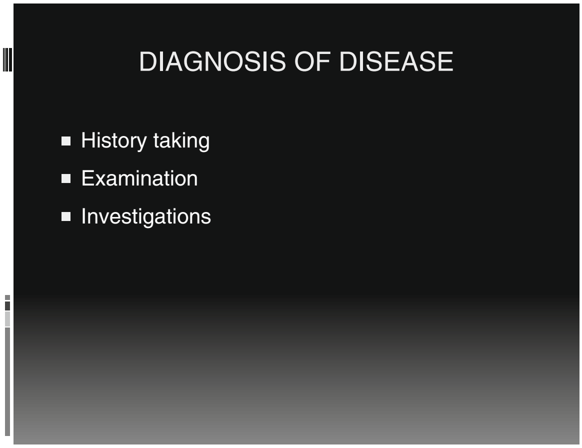
The fifth semester is the preparation of a preclinical student to enter a clinical program. It carries huge importance requiring adequate exposure to clinical medicine.

It involves teaching of: Introduction to Clinical Medicine; Integrative Study of the Basic Sciences (USMLE Review); Learning Counselling and Communication Skills; NBME Comprehensive Exam; Independent Research; Independent Research Elective; Evaluation of students are included.

ICM forms the basis of this semester, when the students are formally taught the fundamental principles of clinical medicine. Beginning with the ethical principles of greetings and introduction, the process of history taking proceeds to physical examination, provisional and final diagnosis, based upon knowledge, as described here in a sample.

8.7 Introduction to Clinical Medicine (Courtesy Zohra Zaidi)





RULES FOR HISTORY TAKING

- Introduce yourself to the patient
- Treat the patient politely
- Respect the patient's dignity and privacy
- Listen to the patient with interest
- Use language which the patient can understand
- Be honest in your approach
- Protect patients confidential information
- Keep your professional knowledge up to date

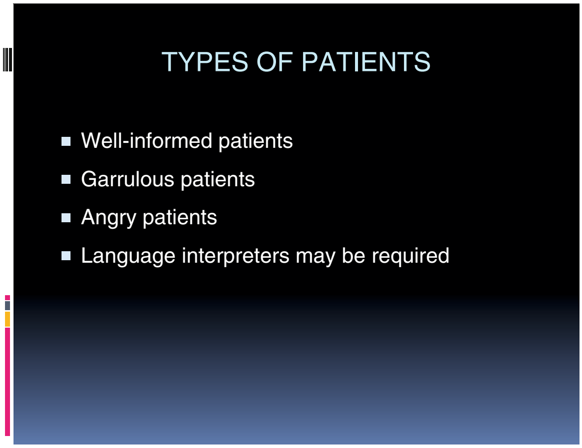
HISTORY TAKING

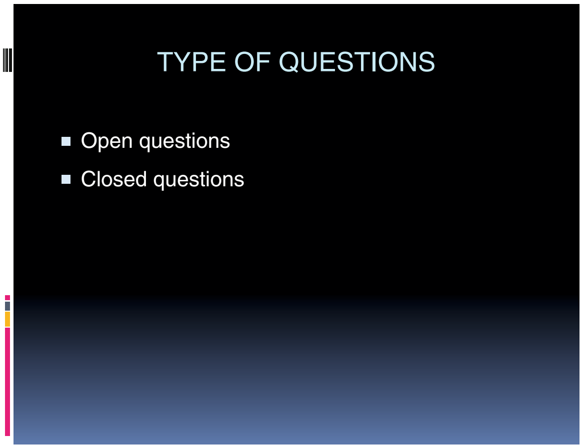
- Name, age, sex, marital status, occupation, address, country of birth
- Main presenting complaint
- Past medical history
- History of the main presenting complaint
- Family history
- Occupational history
- Personal history
- Drug history

MAIN PRESENTING COMPLAINT According to the body system affected

- Lungs
- Heart
- Gastrointestinal system
- Nervous system
- Genitourinary system
- Locomotor system


GASTROINTESTINAL SYSTEM-Common symptoms
ASK QUESTIONS RELATING TO SYMPTOMS
Abdominal pain
Dyspepsia
Dysphagia
Nausea, vomiting
Diarrhea
Appetite
Weight gain or loss
Rectal bleeding
Jaundice


TYPES OF PATIENTS
Well-informed patients
Garrulous patients
Angry patients
Language interpreters may be required


TYPE OF QUESTIONS
Open questions
Closed questions

ANALYSING SYMPTOMS

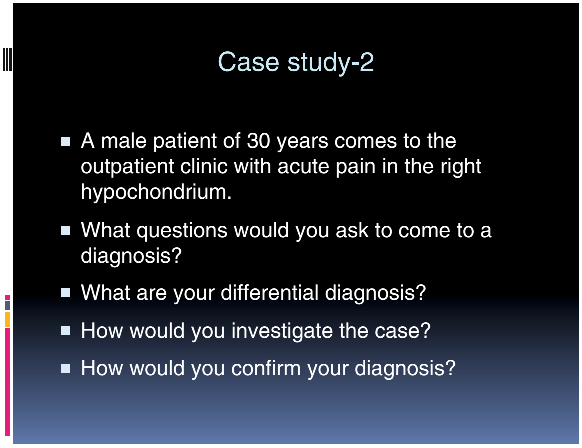
- **Hard symptoms**
  Helpful in the diagnosis e.g. fever with rigors- bacteraemia, viraemia, malaria
- **Soft symptoms**
  Not helpful in the diagnosis e.g. back ache, tiredness

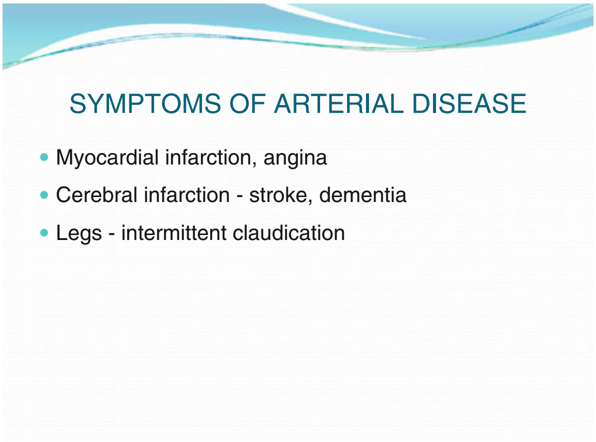
PERSONAL HISTORY

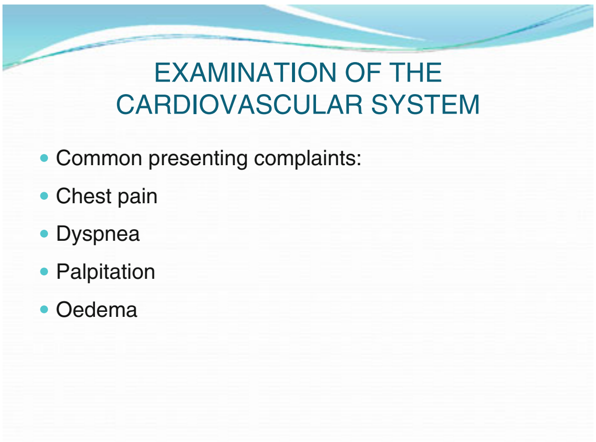
- Alcohol intake
- Cigarette smoking
- Any other

Case study-1

- An elderly woman has a sudden onset of backache.
- What questions would you ask to come to a diagnosis?
- What is your differential diagnosis?
- How would you investigate this case?
- How would you confirm your diagnosis?

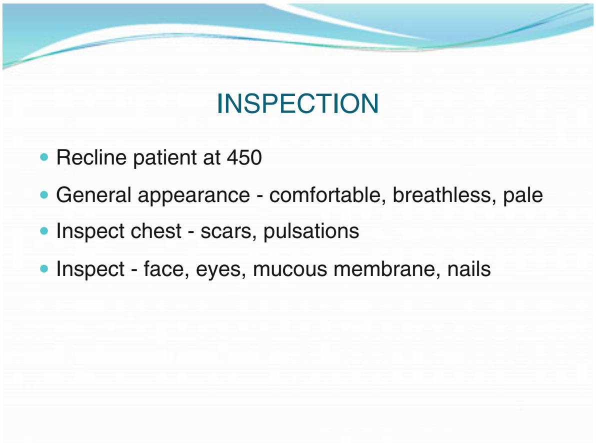

Case study-2
A male patient of 30 years comes to the outpatient clinic with acute pain in the right hypochondrium.
What questions would you ask to come to a diagnosis?
What are your differential diagnosis?
How would you investigate the case?
How would you confirm your diagnosis?

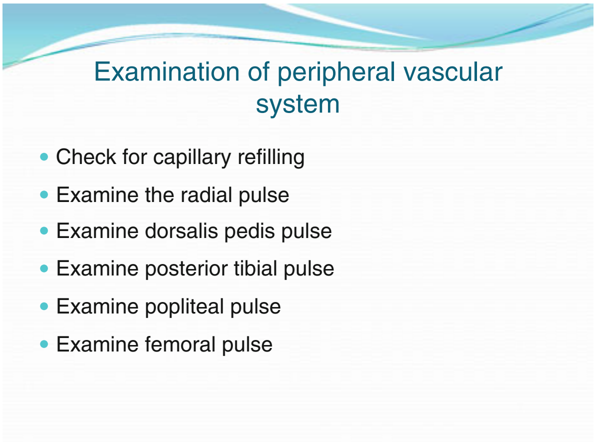

SYMPTOMS OF ARTERIAL DISEASE
Myocardial infarction, angina
Cerebral infarction - stroke, dementia
Legs - intermittent claudication

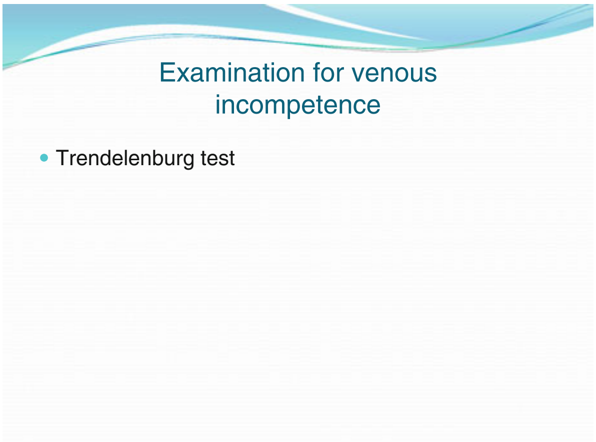

EXAMINATION OF THE CARDIOVASCULAR SYSTEM
Common presenting complaints:
Chest pain
Dyspnea
Palpitation
Oedema

SYMPTOMS OF VENOUS DISEASE

- Venous thrombosis - tenderness, swelling, warmth
- Pulmonary embolus - collapse, breathlessness, pleural pain, haemoptysis
- Varicose veins


INSPECTION
• Recline patient at 450
• General appearance - comfortable, breathless, pale
• Inspect chest - scars, pulsations
• Inspect - face, eyes, mucous membrane, nails


Examination of peripheral vascular system
• Check for capillary refilling
• Examine the radial pulse
• Examine dorsalis pedis pulse
• Examine posterior tibial pulse
• Examine popliteal pulse
• Examine femoral pulse


Examination for venous incompetence
• Trendelenburg test

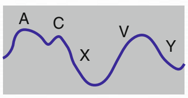
JUGULAR VENOUS PULSE

Jugular venous pressure is an indicator of the right atrial pressure, it provides an indirect measure of central venous pressure.

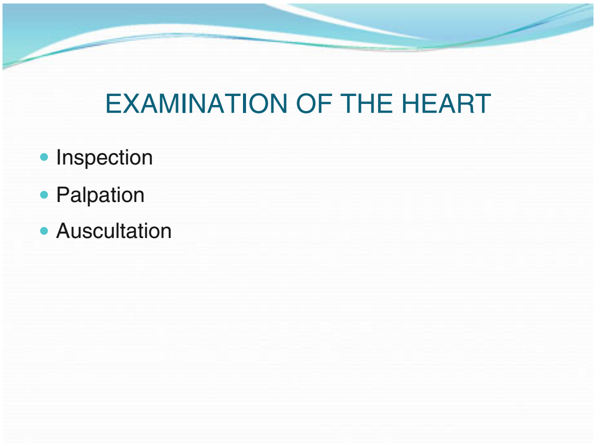
Causes of increased jugular venous pressure

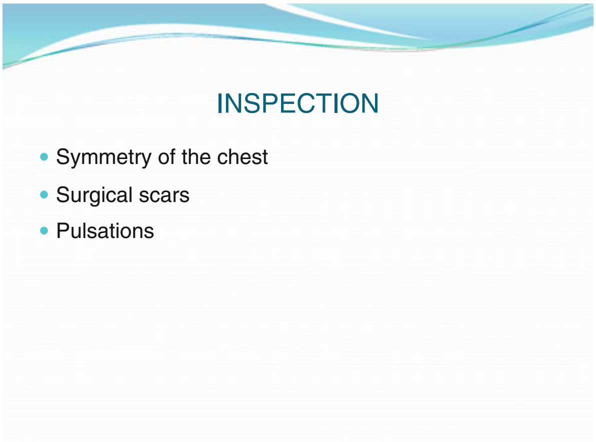
- Congestive cardiac failure
- Cor pulmonale
- Pulmonary embolism
- Right ventricular infarction
- Constrictive pericarditis
- Obstruction of superior vena cava
- Iatrogenic fluid overload

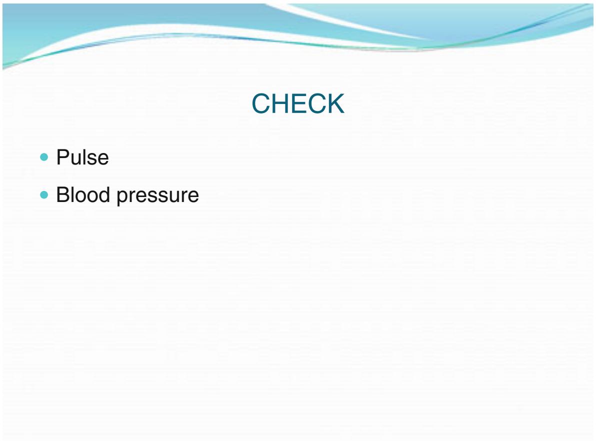
Jugular venous pulse - graph



- A - produced by atrial systole
- C - caused by tricuspid valve closure
- X - caused by descent of the tricuspid valve
- V - caused by atrial filling
- Y - caused by ventricular filling


EXAMINATION OF THE HEART
Inspection
Palpation
Auscultation


INSPECTION
Symmetry of the chest
Surgical scars
Pulsations


CHECK
Pulse
Blood pressure

PALPATION

- Apex beat
- Pulsations

- Apex beat is the lowest and most lateral point at which the cardiac impulse can be palpated

- Location - 5th intercostal space in the mid-clavicular line

AUSCULTATION

- Sites to auscultate
- Apex (mitral area)
- Lower left sternal edge (tricuspid area)
- Upper left sternal edge (pulmonary area)
- Upper right sternal edge (aortic area)

HEART SOUNDS

- 1st sound (S1) - closure of mitral and tricuspid valves at the onset of systole. Best heard at the apex - Lup
- 2nd sound (S2) - closure of aortic and pulmonary valves following ventricular ejection. Best heard at the upper left sternal edge - Dup

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Added sounds

- Low density sounds occur early and late in diastole. When present they give a characteristic gallop to the cardiac rhythm
- S3 - occurs during early ventricular filling
- S4 - occurs during late ventricular filling, due to atrial contraction

INVESTIGATIONS

- Electrocardiogram (ECG)
- Chest X-ray
- Electrocardiography
- Stress electrocardiography
- Cardiovascular radionuclide imaging - CT scans, computed tomography, magnetic resonance imaging (MRI)
- Cardiac catheterization - cardiac angiography, venous angiography, etc.

ELECTROCARDIOGRAM (ECG)

- To determine damage to the heart
- To determine heart rate and rhythm
- Effect of drugs and devices such as pace makers
- Size and position of heart chambers

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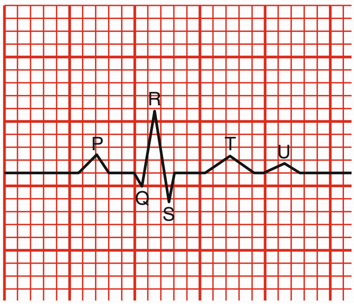
Electrocardiogram



Reading of ECG

- P wave is the first short upward movement of the EKG tracing. It indicates that the atria are contracting, pumping blood into the ventricles.

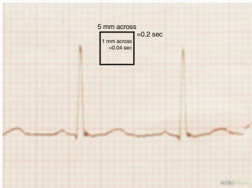
  The QRS complex, normally beginning with a downward deflection, Q; a larger upwards deflection, a peak (R); and then a downwards S wave. The QRS complex represents ventricular depolarization and contraction.

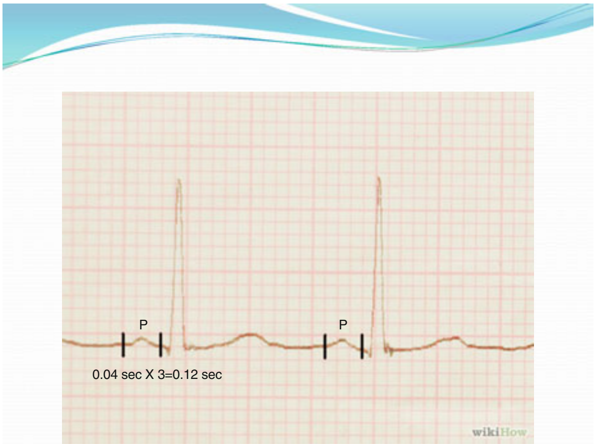
  The PR interval indicates the transit time for the electrical signal to travel from the sinus node to the ventricles.

  T wave is normally a modest upwards waveform, representing ventricular repolarization.

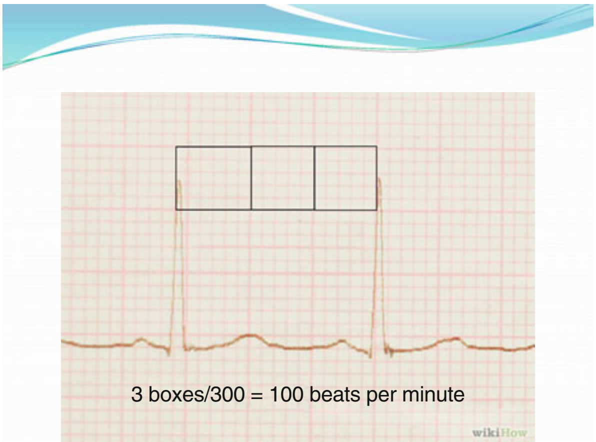
Understand the grids of an ECG paper

- Voltage is measured along the vertical axis; time is measured along the horizontal axis in squares.
  There are large squares that are divided into smaller squares.
  Small squares are 1 mm across and represent 0.04 seconds.
  The large squares measure 5 mm across and represent 0.2 seconds.
- 10 mm in height is equal to 1mV in voltage.




P
P
0.04 sec X 3=0.12 sec
wikiHow


P
P
0.04 sec X 3=0.12 sec
wikiHow


3 boxes/300 = 100 beats per minute
wikiHow

Normal 12 lead ECG

- LIMB LEADS
- Bipolar lead 1,11 and 111
- Unipolar lead aVR –aVL-aVF
- CHEST LEADS
- Precordial chest leads V1-V6

UNIPOLAR LEADS

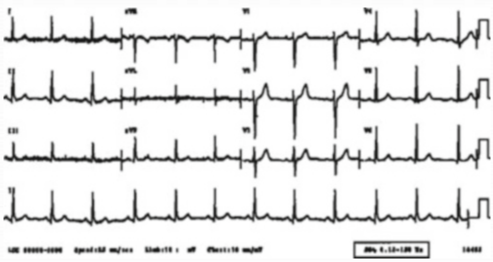
- Those connected to a limb -aVR-aVF-aVL
- Those connected to the chest- V1-V6

Case study - 1

- (1)- A34 year old women with palpitations.
- What specific questions would you ask?
- What is the most likely diagnosis?
- What examination would you perform?
- What would be the initial management?
- What investigations would you like to confirm your diagnosis?

Case study -2

- (2)A 55 year old man with sudden onset of chest pain.
- What specific questions would you ask?
- What is the most likely diagnosis?
- What examination would you perform?
- What would be the initial management?
- What investigations would you request to confirm the diagnosis?
- What other issues should be discussed?



Learning Resources

Introduction to clinical medicine
Davidson's book of medicine
Personal experience in clinical teaching

The whole philosophy behind most Caribbean schools, including the AUB, is to transfer smoothly the medical students to US, Canada, UK, etc. In the due course of time they will be absorbed into the respective health systems after passing their USMLE (United States Medical License Exam) and competing in the residency matching programmes. The Clinical Science Program in the AUB comprises 72 weeks of clinical rotations at our affiliated hospitals and specialised clinical facilities in Georgia, USA. During the rotations/clerkships, the student participates in supervised patient care while rotating through various medical specialties and subspecialties. Training includes history taking, physical examinations, laboratory analysis, case presentations, clinical workshops and conferences. The student receives personalised guidance from the clinical faculty to develop essential skills and knowledge. The student also has an opportunity to assess the degree of his/her interest in each of the major fields of medical training.

The 72 weeks of clinical rotations consists of 48 weeks of core rotations and 24 weeks of elective rotations.

Core rotations	Duration
Internal medicine	12 weeks
Surgery	12 weeks
OB-GYN	6 weeks
Paediatrics	6 weeks
Psychiatry	6 weeks
Family practice	6 weeks
Total	48 weeks

Elective rotations	Duration varies (minimum 4 weeks each)
Nephrology	Urgent care (family practice)
Haematology and oncology	Dermatology
Rheumatology	Orthopaedic surgery
Immunology and allergy	Ophthalmology
Gastroenterology	Otolaryngology (ENT)
Neurology	Plastic surgery
Cardiology	Colorectal surgery
Pulmonology	Cardiology (PEDS focus)
Infectious disease	
Total	24 weeks

Early exposure to patients is currently being encouraged in most institutions. AUB does the same. Numerous studies duly highlight the importance of early clinical exposure. Likewise, the importance of the background of students applying for admission is also the subject of many studies (Carney et al. 2004). Craig et al. (2004) investigated this point.

Their investigative results showed that the students with science-based first degrees performed better in the SBA assessments. The same occurred initially in the MEQs (Modified Essay Questions), but the effect diminished with time. The health profession students performed consistently better but converged with other groups over time, particularly in the MEQs. Relative performance by the non-science students improved with time in both assessment formats. Overall, differences between the highest and lowest groups were small and very few students failed to meet the overall standard for the summative assessments. Health profession and biosciences students had the lowest failure rate. Non-science students were more likely to fail the assessments in Years 2 and 3, but their pass rates were still high. Female students performed significantly better overall at the end of Year 2 and in Year 3. There were only minor differences between Australian resident and international students.

While there were small differences in performance in the basic and clinical sciences early in the programs, these diminished with time. The authors believe the results of this study will inform decisions regarding timing of summative assessments, selection policy and providing additional support to students who need it to minimise their risk of failure.

The study was biased as it referred to student performance in only one of the four curriculum themes, where health professionals and science graduates would be expected to have a significant advantage.

As explained by the authors, this study does not truly reflect the outcome of various groups applying for admission into a medical school. We hope to conduct a study based upon the AUB criteria of admission.

8.8 Faculty Training and Medical Education Workshops

Numerous workshops and interactive seminars are designed and conducted by the department of medical education. The following topics are covered in these bimonthly academic activities:

1. History of medicine
2. Medical ethics
3. Epiemeology and health economics
4. Biostatistics
5. Research methodology, methods and designing of a protocol
6. Medical writing, original papers, review articles, case reports, etc.
7. Communication skills
8. EBM
9. Curriculum designing

10. Instructional strategies
11. Assessment and evaluation
12. CPR/BLS
13. ALS
14. Skill laboratories and development of structures and simulated patients
15. Computer and use of bibliographic software, e.g. EndNote, etc.

Students are encouraged to develop basic research projects and participate in the seminars.

8.9 Medical Education in India: ERA's Lucknow Medical College

Hindustan is an ancient country. It has many names like India, Bharat or Bharat Mata, etc. Its history goes back to almost the same period as Babylon. The archaeological discoveries in Harappa, Potahar, Kot Diji and the most famous of them all at Moen Jo Daro trace the existence of civilised nations to almost 300 years BC. On a visit to Moen Jo Daro near Larkana in Pakistan, the author was amazed to see the highly developed sense of personal and community hygiene that these folks enjoyed. The mount of the dead, i.e. Moen Jo Daro was probably destroyed by floods in the river Indus which now flows many miles away from this region. The organised lane structure with a drainage system, a communal bath and the necessary items for storage of grain and keeping animals , etc. are quite astonishing. Regrettably, the place is decaying as the apathy of the government makes it obvious that nobody cares about the mount of the dead any more. They care even less for the living!

Kot Diji is another ancient place near Khairpur, where the author (SZ) spent his young life. Kot Diji is probably older than Harrapa and Moen Jo Daro. It shows the ancient relics of the towns and the fort in which Sindhis lived. Once gain the standard of hygiene maintained by these folks was amazing, albeit less defined than Moen Jo Daro.

The earliest recorded document of Indian history called Reg-Veda, dated to about 1500 BC, describes the treatment of people through magic and incantations. Religion and myth have always played a significant role in the history of mankind. The high priest in the Indian civilisation of Moen Jo Daro and elsewhere had a huge significance and one presumes he had many disciples who must have learnt the art of spiritual healing from their master after remaining in his attendance for many, many years.

In a later document, called the Atharav-Veda of about 700 BC, two names of writers, presumably physicians, appear to document some relevant medical information. They were CHARAKA and SURUTA. Apparently CHARAKA was a contemporary of the beginning of the Christian era and SURUTA lived in the fifth century (pp 32). Stories of folks dying with fever and rigours, possibly malaria, plague or TB are given, people dying of cough with fever and blood in sputum, etc. being well documented. These folks were mostly treated with isolation and herbs, which was an art of the apothecary taught by the master to their *chela*s through observation, supervision and practical application.

Stories of surgical excellence in Hindu culture are duly highlighted in many of these ancient writings. Obviously the surgeon must have had many assistants who would have learnt the art through observation, assistance and practical application, initially under the watchful eye of the master, then on his own.

In the Hindu temples and the *dharamshalas* the principle of a guru and several chelas is as old as the religion itself. Some of these *chelas* would dedicate their entire life in the service of the guru, thus imbibing the philosophy and faith through him. The same applied to the training of veds and apothecaries. They also used to have small to medium size pharmacy laboratories in which the *chelas* would do all at the hard work of grinding the salts and minerals, herbs and plants, etc. using the ageless mortar and pestle. Some would have small distilleries for boiling, distilling, fermenting the plants and vegetables and to prepare lotions, potions, ointments and liniments. This practice is still employed in the Indian subcontinent in Eastern medicine.

China is also an ancient country. After waking from its sleep, it has now emerged as nasally the richest nation in the world. Chinese *Hikma*, i.e. wisdom, dates back to Confucius, who is often quoted as a great thinker of the past although his sayings are still applicable, and surprisingly enough, contemporary too.

Shen Nung (pp 34), has been called the father of ancient Chinese medicine. He was a great physician, experimentalist and a formidable teacher, who discovered a large number of herbal medicines and poisons. He lived about 3000 BC, so about the same time as Babylon or Harappa in Pothohar.

Magic and sorcery was a common practice in China, and one might say that dragons and the use of Hippo corn, etc. are still cardinal features of Chinese medicine witnessed in most Chinese towns. However, the famous Chinese practices of acupuncture and Tai Chi have stood the test of time and are now taught through instructional sessions in the modern world as indeed must have been the norm in olden days. China has common borders with India.

Lucknow was the capital of Avadh for centuries. Its rulers descended from a Persian adventurer by the name of Saadat Ali Khan. The nawabs ruled Avudh with autonomy and panache. In 1775, Nawab Asaf us-Daul ah, son of Nawab Shuja-ul-Daulah, moved his capital from Faizabad to Lucknow and brought about a revolution in architecture. The famous Bara Imambargsh is a living legend of his time. It was built by the Nawab to help ease the economic constraints of his 'aristocratic' population. They could work as labourers in the dark hours to save grace while earning decent money.

Lucknow is perched by the river Gomti. The rich culture of Lucknow, its traditions, its cuisines and its gardens have been recorded in history as the best ever. The Indian film industry has immortalised some aspects of the rich Luckhnavi culture in legendary films like Pakeeza and Umrao jan Ada.

However, this is not a true reflection of Lucknow. Its main a contribution has been in the field of education, and particularly religious teaching over the centuries. Scholars of huge magnitude have taught and preached Islamic jussi prudence, ethics, morality and Fiqah to thousands of students, who in turn became scholars in their own right.

ERA's Lucknow medical college and hospital was established in 2001 under the aegis of an educational trust. The details can be accessed through their web page: www.elmcindia.org

ERA's medical college offers an MBBS over a 4 1/2-year period, with 1 year of compulsory internship. The teaching is traditional and lecture-based, but duly supported with an active learning process by the students. ERA's principle is that education is student-centred rather than teacher-centred. Here is a sample of the syllabus currently in vogue at ERA.

The total duration of the MBBS course is 54 months, divided into 2 semesters per year covering a period of 4 1/2 years. The course follows the guidelines laid down by the Indian Medical Council. Its students, however, are bright and trained enough to compete for any entrance exam as such as the PLAB or USMLE.

The first professional has 2 semesters of 6 months duration each, covering anatomy, physiology, and biochemistry.

The second professional has 3 semesters of 6 months duration each. So it has three semesters in all, covering pathology, microbiology, pharmacology and forensic medicine.

The third professional is divided into two parts. Part 1 has 2 semesters of 6 months each. It covers ophthalmology, ENT and social and preventive medicine.

The 2nd part of the 3rd professional comprising the 8th and 9th semesters of 6 months duration each, covers the major subjects such as medicine, surgery, paediatrics, obs and GY.

The final professional exam is a summative exam, which is held at the end of the ninth semester. The degree is awarded after satisfactory completion of a year of compulsory rotatory internship, in the affiliated 920-bed hospital.

ERA also offers postgraduate courses, diplomas and degrees in 18 subjects. Future expansion into other fields such as dental surgery, engineering, law, mass communication and journalism are envisaged by its trustees.

The two models given above are included in this book to display the global status of medical education in this century. AUB is a model of modern, integrated, problem-based EBM taught through the latest use of technology. ERA represents the traditional format, very popular in most countries in the world. The teachers can choose for themselves what suits them best, keeping in mind the mission statement of their institution, and considering the best interest of the community their students serve.

So here are the two models of medical education prevalent in 2014. One from India following the traditional curriculum and the other from the Caribbean island of Barbados following a modern methodology of an integrated curriculum, taught through a hybridised version, as a combination of short introductory lectures followed by small group tutorials, discussions, and skill laboratories. Many subjects taught in India, Pakistan and the Middle East, such as forensic medicine and hygiene, are considered to be somewhat redundant in modern education.

In fact, going back on to the criteria for admission in medical colleges in the subcontinent, there is much to be desired.

In the 1990s, Zaidi, as the head of medical education in a prestigious medical college, openly stated at the faculties and university levels in Pakistan that the criteria of teaching zoology and botany or dissecting frogs and studying plants does not help a medic to become a good doctor. Instead, they should be taught humanities, human history, morality maths, physics and chemistry. The argument was that, in a practical world, knowledge of zoology and botany, on which a formative 2 years of a young person's life are spent, may not be productive in making him as humane and moral as would the teaching of humanities. But who listens to a lonely voice in a limitless Sahara!

This is the major difference that one sees amongst the American and British influenced premed programmes. The Americans send their young school leavers on 4 years of study of liberal arts, including subjects such as philosophy, social sciences and anthropology. By the time they enter medical school their minds have matured enough to appreciates health issues and human values. Therefore they find it not just enjoyable but challenging for their intellectual growth to solve problems from day 1.

In 1910 Flaxner gave the world his traditional curriculum, but as educationists we feel that modern tools of education are far superior, albeit more demanding, both on the part of the students and the faculty.

AUB is a fine institution, where international students are under the tutelage of an international faculty targeted towards delivering the finest education to match the US and Canadian Health systems.

One must give due credit to all those institutions such as the Dow Medical, Baqai Medical, ERA and AKU for producing students who compete with the American students and international students such as those from St George's or Xavier in the Caribbean geared towards the American health system, and who obtain top slots in the residency programs.

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ERA's Lucknow Medical College and Hospital. www.elmcindia.org

Future Trends

9

Walled cities, gated campuses and closed complexes are the traditional seats of teaching and learning. Times are, however, rapidly changing. The Open University is a reality in the UK; it began not long ago and has gained huge popularity, imparting education to many pupils through a non-traditional strategy. Some of the courses have been so popular with the masses that they have been converted into educational documentaries by the BBC.

The Open University was developed to become a source of education across all borders. Nobody could guess then that IT would bring about a paradigm shift in the philosophy of education. It would reach out to all those distant learners who may find it hard to attend a conventional teaching establishment. As early as 1926, JC Stobart, a prominent educationist, wrote to the BBC, thinking along the lines of a 'wireless university'. That was the only means of communication in those early days and TV had to wait until the 1940s to hit wireless news, as an alternative.

In 1960s the concept was accepted by the BBC and the Labour government to launch a University of the Air. It actually began to function as an open university in 1969–1970.

Online courses are now the norm. Many top universities are going online. Even the traditional universities are, partially as well as fully, switching many of their existing programs to DL mode (http://www.seniornet.org/edu/art/history.html).

No doubt the atmosphere, environment and ambience of a university campus is irreplaceable but, due to rapid advance in IT, open courses have also become reality. As a matter of fact, some diehards believe it to be the future of education. In other words, the knowledge has been emancipated; previously, the courtyards, the corridors and the quadrangle had kept knowledge somewhat confined. The lecture halls and auditoria have a natural ambience, which, by itself, is a source of inspiration in a university campus. However, the acceptability of online courses by the major stakeholders, i.e. the students, has made it a popular mode. The concept of Distance Learning (DL) is gaining popularity, mainly on account of cost and effectiveness. Correspondence courses existed in academic circles. Technology has, however, enhanced this idea (http://www.webopedia.com/TERM/D/distance_learning.html).

S. Zaidi, M. Nasir, *Teaching and Learning Methods in Medicine*,
DOI 10.1007/978-3-319-06850-3_9

Basically, a registered and accredited university hires IT experts who develop the software for transmitting PowerPoint presentations or lectures through the web page. Students can access the information by enrolling with the university and obtaining a personal identification code in the form of a password.

Here is a brief working paper, prepared at the author's request by Abid Naqvi, a Canadian expert in the field. It was written for the guidance of the trustees of Fatima University, NY, who are due to launch their online course in humanities and life sciences in the fall of 2014. (www.fatiamunin.org).

For the new initiative of Open University (OU) under the aegis of 'Fatima University', the technology will be the core concept and a critical platform, apart from the academic mission which is the ultimate objective of any university. In order to embark upon the implementation of Fatima Online Unversity (FOU), two teams shall have to be constituted, i.e. 'Academic' and 'Technology' teams, under the overall supervision of a governing body (FOU Council). The council needs to have enough members from well-diversified expertise such as education, medicine, finance, law and technology with good experience in university administration for an effective launch of FOU.

General scope of each team:

- *Academic Team*

  This team shall consist of experienced professors and administrators and shall be entrusted with the task of developing strategic academic programs (both long- and short-term), curricula, affiliations and ranking issues. Feasibility, initial start up and the paperwork of OU shall also be planned and monitored by them.
- *Technology Team*

  This team shall consist of experienced IT experts, and shall be entrusted with the task of planning and implementing cost-effective Enterprise Resource Planning (ERP) systems for the long-term needs of the OU. It will be responsible for formulating IT framework and policy for the university and hiring an efficient project team to establish the technological base (http://www2.cit.cornell.edu/computer/robohelp/cpmm/Project_Roles_and_Responsibilities.htm)

  The project management team (established by the Technology Team) is responsible for conducting the scheduled work, administering the project and communicating with the in-house team and the consultants (http://www.eresourceerp.com/functions-of-ERP-project-management-team.html)

  Education institutions and universities all over the world are facing challenges in designing robust ERP applications and methodologies to align themselves with the expectations of students and other stakeholders. The existing standard ERP solutions are proprietary, inflexible and expensive to implement in academia (http://www.personal.psu.edu/dxf19/blogs/dolores_list_of_cfps/2011/05/enterprise-resource-planning-models-for-the-education-sector-applications-and-methodologies.html)

Before embarking upon a formal organisation of an open university, some 'spadework' may be contemplated on the following lines:

Steering Committee and Initial Feasibility Report
Vision, mission and values concepts for 'Open University'
http://www.scu.edu/jesuit/University-Mission.cfm
Timeline for meetings and implementation
Governing concepts
http://www.oecd.org/edu/imhe/37378242.pdf
Organisation Structure and Key Officials
http://education.stateuniversity.com/pages/1859/Colleges-Universities-Organizational-Structure.html
http://www.ouhk.edu.hk/WCM/?FUELAP_TEMPLATENAME=tcSingPage&ITEMID=CCHRUCONTENT_485089
IT platform
Ranking concepts/affiliations
http://www.eua.be/pubs/Global_University_Rankings_and_Their_Impact.pdf A type of education, typically college-level, where students work on their own at home or at the office and communicate with faculty and other students via *e-mail*, *electronic forums*, *videoconferencing*, *chat rooms*, *bulletin boards*, *instant messaging* and other forms of computer-based communication.

Most distance learning programs include a *computer-based training* (*CBT*) system and communications tools to produce a *virtual* classroom. Because the *Internet* and *World Wide Web* are accessible from virtually all computer *platforms*, they serve as the foundation for many distance learning systems.

9.1 Governing Boards

http://education.stateuniversity.com/pages/1859/Colleges-Universities-Organizational-Structure.html

A university's governing board, also known as the trustees, regents, or board of visitors, possesses fundamental legal authority over the university. The authority of the governing board is vested in it by the state wherein the school resides or, particularly in the case of older, private institutions, by legally binding royal or colonial charters. Both public and private governing boards generally consist of citizen trustees. In the public case those trustees are often political appointees who serve as a fundamental link between the institution and state and national political structures.

Two popular software programs currently under use in some British and American universities are Moodle and Adobe Presenter. However, there are surely many which are being developed as we write.

9.2 An Online Course

A sample of an online course designed by Dr Farzana Naqvi, Dean of the faculty of life sciences, in the Fatima University (www.fatiamuniversity.org), is included here for guidance.

Life Sciences Discipline in FOU

- Individual courses
- Certificate programs
- Undergraduate degree
- Graduate degree
- Doctorate program

1. Outline for Individual courses in Life Sciences. (few model courses)
   Bio 101. Introduction to Biology
   An online course for science students/refreshers to provide a basic knowledge of general biology
      Unit 1: Introduction to Biology; The Biology of Cells; Fundamentals of Genetics; Molecular Genetics
      Unit 2: Evolution and Diversity; Theories of Evolution; Human Evolution and Diversity
      Unit 3: Biodiversity: Diversity in Plants, Their Form and Function; Diversity in Animals, Their Form and Function
      Unit 4: Ecology
   Bio 102. Fundamentals of Biology
      Unit 1: Structure and Function of Cells: The Cytoskeleton and Cell Surface; Membrane Function and Signal Transduction
      Unit 2: The Nuclear Compartment: Chemical Composition; Protein, DNA, RNA
      Unit 3: Cell Cycle: Mitosis and Meiosis, Check Points in Cell Cycle
      Unit 4: Stem Cell Research
   Bio 201. Cell and Molecular Biology
      Unit 1: Introduction to Principles of Genetics
      Unit 2: Classical Concepts of Mendelian Inheritance
      Unit 3: Basic Principles of Molecular Genetics
      Unit 4: Inherited Pattern of Genetic Diseases
   Bio 202: Genetics and Molecular Biology
      Unit 1: Principles of Heredity: Mendelian Ratios, Exceptions and Extinctions
      Unit 2: Sex Determination; Ratios, Linkage and Mapping
      Unit 3: Genes and Environment
      Unit 4: Population Genetics
   Bio 203: Introduction to Genetics
      Unit 1: Biochemistry of Heredity Material: Nucleic Acids; DNA, RNA

Unit 2: Function of Genetic Material: DNA, RNA, Replication, Transcription, Translation

Unit 3: Chromosomes and Heredity: Structure and Behaviour of Human Chromosomes

Unit 4: Mechanism of Mutations:

Stat. 200: Biostatistics 1

Unit 1: Basic Statistical Concepts: Data Measurement: Nominal, Ordinal, Interval, Ratio Level

Unit 2: Distribution and Sampling: Discrete and Continuous Distribution, Random Sample; Non-random Sample

Unit 3: Presentation of Data: Frequency Distribution; Graphical Distribution

Unit 4: Measure of Central Tendency: Mean; Median; Mode; Percentile

Unit 5: Measure of Variability: Range; Variance; Standard Deviation, Z Score; Coefficient of Variation

Unit 6: Probability: Introduction and Methods to Assess Probability

301: Medical Genetics

Unit 1: Fundamentals of Transmission Genetics: Pedigree Analysis of Dominant and Recessive Human Gene Traits

Unit 2: Human Genome: Structure of Chromosome and Genes: Morphology of Human Chromosome Using Banding, Molecular Basis of Sex Determination; Dosage Compensation

Unit 3: Abnormal Structure of Chromosome: Balanced and Unbalanced Aberrations

Unit 4: Molecular Mechanism of Mutations: Point Mutations, DNA Damage, Error in Replication, Trinucleotide Repeats

Unit 5: Oncogenes in Humans: Activation of Oncogenes; Molecular Basis of Cancer

Biol. 401: Bioethics in Genetics

Ethical Issues: New Reproductive Techniques; Genetic Diseases; Genetic Testing; Prenatal and Pre-symptomatic Screening

Biol. 402: Stem Cell Biology

Concepts in Stem Cell Research: Embryonic Stem Cells; Adult Stem Cells; Applications of Stem Cells Treating Diseases.

2. Outline of Undergraduate Degree Programme in Life Sciences (proposed synopsis)

   Bachelor of Science, Major Programme

   This degree is designed for students who want to specialise in biology/life science

   Degree requirement: 120 credits with a grade point average(GPA) of 2.0–4.0

   The programme is comprised of eight semesters, distributed as follows:

   General courses (24 credits)

   English (university level) (6 credits)

   Humanities (6 credits)

   Mathematics (foundation courses) (6 credits)

Social sciences (6 credits)
Elective courses (27 credits)
Calculus I and II (6 credits)
Statistics I and II/computer courses (6 credits)
Eighteen credits from any of the life science subjects (biology, genetics, microbiology, plant sciences, animal sciences, biotechnology) to be completed in first and second years of the degree programme)
Major courses: 30 credits in the area of biology/genetics/biotechnology/bioinformatics, etc.
Directive studies: 30 credits, study of a topic selected by an online faculty member or special papers

Plan of study for Bachelor of Science in Life Science
Pre-requisite: completion of Grade 12 or equivalent
Duration: 4-year program spread over 8 semesters with 2 semesters each year
Degree requirement: minimum of 120 credits required to complete the Bachelor's degree in Life Sciences
Semester 1
Course No
Course Title
Credit Hour
Eng. 100
English 1
3 + 0
Hum. 100
Humanities 1
3 + 0
Biol. 101
Introduction to Biology
3 + 0
Math 100
Mathematics 1
3 + 0
100
Elective 1
3 + 0
Semester 2
Eng. 100
English II
3 + 0
Hum. 100
Humanities II
3 + 0
Biol. 102

Fundamentals of Biology
3 + 0
Math. 100
Mathematics II
3 + 0
100
Elective II
3 + 0
Semester 3
Biol. 201
Cell and Molecular Biology
3 + 0
Biol. 203
Introduction to Genetics
3 + 0
Stat. 202
Biostatistics I
3 + 0
Cal. 1 200
Elective I (Calculus 1
3 + 0
200
Elective II (Religion or cultural studies)
3 + 0
Semester 4
Biol. 202
Genetics and Molecular Biology
3 + 0
Biol. 204
Human Physiology
3 + 0
Stat. 200
Biostatistics II
3 + 0
Cal. 200
Elective I (Calculus II)
3 + 0
200
Elective II (Sociology or Psychology)
3 + 0
Semester 5
Biol. 301
Plants and Environment
3 + 0
Biol. 302

Advanced Human Physiology
3 + 0
Biol. 303
Biodiversity
3 + 0
Biol. 304
Community and Ecosystem
3 + 0
Biol. 305
Evolution
3 + 0

Semester 6
Biol. 306
Introduction to Biotechnology
3 + 0
Biol. 307
Animal Behaviour
3 + 0
Biol. 308
Bioinformatics I
3 + 0
Biol. 309
Introduction to Bioethics
3 + 0
Biol. 310
Immunology
3 + 0

Semesters 7, 8 will comprise advanced levels (400) of major biology fields, such as Biotechnology, Bioinformatics, Bioethics, Molecular Biology, etc. with special papers in each semester or directive studies of 30 credit hours (15 credit hours/semester)

Elective Courses

Calculus I and II
Computer Courses
Chemical Sciences (Chemistry, Biochemistry)
Social Sciences (Sociology, Psychology, Philosophy, Comparative Religious Studies)

A model graduate certificate course
Online bioethics certificate
Admission:

Spring deadline	Jan 1
Fall deadline	July 1, 2014
Certificate from Masters of Science in Bioethics program	

Courses offered:

Bioeth. 401	History and Philosophy of Bioethics	3 credit hours
Bioeth. 404	Ethical issues in predictive testing	3 credit hours
Bioeth. 503	Research Ethics	3 credit hours
Bioeth. 506	Neuroscience and Ethics	3 credit hours
12 credit hour graduate certificates will be awarded in 'Bioethics'.		
These courses are also offered for the Masters in Bioethics program.		

Pattern or Format

- Three lectures of 45 min per week
- Formal writing assignments
- Final written exam

Learning Objectives

This graduate online certificate program in bioethics will enhance employment opportunities in;

- Hospital communities, as advisor/counsellor to the doctors, families and patients with struggling and difficult decisions
- Academia, offer opportunities in fields such as philosophy, health science and biology
- Health related industries

Credits of all these courses are accepted for Masters program in Bioethics

References and Further Reading

Fidishun D (2011) Virtual and Interactive Learning in Transformation and Imparting Education in the Digital Era. Hershey, PA, USA. 10/2012

http://www.open.ac.uk

http://www.webopedia.com/TERM/D/distance_learning.html

Further Reading

Colleges and Organizational Structure of Universities – Governing Boards, The President, Faculty, Administration and Staff, Students, Future Prospects – StateUniversity.com http://education.stateuniversity.com/pages/1859/Colleges-Universities-Organizational-Structure.html#ixzz2dtUtXqnL

10 Epilogue

The caravan of knowledge, which began its journey a long time ago, has crossed the hilltop monasteries, and abyssal caves, the wild Sahara and the bottomless oceans, to reach the modern day. These are exciting times, full of potentials for further evolution of the human mind. From the early times of the philosophers through the following years dominated by theology, it has now ventured into the era of information technology. Information is knowledge, which is power. So one may conclude by saying that today we taste the best fruits of education – and there is a lot more to come.

The journey continues…

The End. 8 pm on 31-3-14

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DOI 10.1007/978-3-319-06850-3_10

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S. Zaidi, M. Nasir, *Teaching and Learning Methods in Medicine*,
DOI 10.1007/978-3-319-06850-3