

Inpharmation Pharmacy Newsletter



“Medical errors are the eighth leading cause of death for Americans — more than motor vehicle accidents, breast cancer or AIDS.”



Helen Pruski, RPh
TH Senior Pharmacist, Pyxis Manager
Serving Downstate Pharmacy since
June 8, 1979

Inpharmation (Pharmacy Newsletter) a bi-monthly newsletter provided for the employees at the University Hospital of Brooklyn. This publication communicates information regarding drug policy, formulary changes, medication usage evaluation results, adverse drug reactions, medication administration and monitoring, and other topics.

Inside This Issue

- 1 Medication Reconciliation
- 2 Clinical Update: Enteral Feeding Tubes and Medications
- 3 Pharmacy News
- 4 Pharmacy and Therapeutic Committee News:
Additions to the Formulary
Deletion from the Formulary
New DVT Prophylaxis Form
- 5 Report of Adverse Drug Reactions for
October-December 2005

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Identifying the most accurate list of medications (prescription medications, OTC, Herbals and vitamins) a patient is taking is an important goal in order to assure quality patient care.

An important aspect of the reconciliation process is to ensure that caregivers and pharmacies receive the most up-to-date list of medications a patient is currently prescribed. This includes name of medication, dosage, frequency and manner in which a patient is taking the medication (such as by pill or liquid). Through the development of a Medication Reconciliation Form, the medication reconciliation process can be greatly improved.

Medication Reconciliation

Medication Reconciliation: JCAHO Compliance to Increase Patient safety and Reduce Medication Errors. JCAHO. Surveyors are looking for evidence of Medication reconciliation plans by Hospitals which must be fully implemented by 2006.

Medical Reconciliation is a standardized process of identifying the most accurate list of a patient's medications. Medication reconciliation is no longer just a sound patient safety practice—it's now a JCAHO requirement. It requires comparing patient's existing medications with those physicians might order during admission, transfer or discharge. The key to the reconciliation process is an accurate Medication Reconciliation Form carried by the patient.

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This form provides a complete list used of medications by the patient. It compares the patient's list of current medications (Home Meds) with the new medicines a physician may order during a patient's admission, transfer and discharge from the hospital. This will help to avoid duplication and ensure that current therapy is not discontinued. The patient is instructed to carry this with them at all times so that the physician, hospital or pharmacy will have access to an accurate list. The medication list is updated when changes in medications are made and any time a patient is admitted they will be discharged with a new medication form.

The Medication Safety Reconciliation team at The University Hospital of Brooklyn (LilyAnn Jeu, Pharm.D., Muhammad Islam, P.I. Coordinator & Maureen Green, Director of Patient Safety) are currently designing the Medication Reconciliation Form. After several revisions, the Medication Reconciliation form is going to be presented to the Pharmacy and Therapeutics Committee on February 14, 2006 for approval.

Clinical Update: Enteral Feeding Tubes and Medications

Drug therapy can be challenging in hospitalized patients receiving nutrition via enteral feeding tubes. Dosage form selection and appropriate administration methods are crucial in patients with feeding tubes. Administering oral medication through the enteral feeding tube can lead to complications like tube obstruction, increased toxicity or decreased drug activity. Careful selection and preparation of dosage forms reduces the complication of medication administration. Flushing the feeding tube and screening for drug incompatibilities decreases the incidence of tube obstruction and replacement. Before giving medications via feeding tube it is important to evaluate tube type, tube location in the GI tract site of drug action and absorption, and the effects of food on drug absorption.

For example, antacids, bismuth and carafate act locally in the stomach and are not suitable for administration via intestinal feeding tubes. Bioavailability may increase with intrajejunal administration of drugs with extensive first-pass metabolism, such as opioids, tricyclics, beta blockers or nitrates. Buccal and sublingual dosage forms may be ineffective when given enterally.

For drugs that require administration on an empty stomach, it is important to stop enteral tube feeding for 30 minutes before and after dosing if the tube is placed in the stomach.

The use of liquid form is preferred whenever possible. Liquid preparation for oral or IV use may be substituted for solid dosage forms. Many tablets may be crushed to a slurry in water, and given through a large-bore feeding tubes. The contents of most capsules may be administered in the same manner.

Regardless of which dosage form is used, the feeding tube should be flushed with at least 20 mL of water before and after administration to clear any residual medication. In general medications should not be added to the enteral formula, both to reduce the risk of microbial contamination and to avoid drug-nutrient incompatibilities.

Many oral products should not be crushed (see Table 1). Sustained release, enteric-coated or microencapsulated products should neither be crushed nor given through feeding tubes as intact tablets or capsules. Crushing destroys the sustained-release tablets and microencapsulated drugs, resulting in erratic blood levels. Enteric coatings do not crush well but break into small chunks that bond together when moist, clogging the tube. Avoid crushing drugs with teratogenic, carcinogenic or cytotoxic properties, such as neoplastic hormones, and prostaglandin analogs.

The pellets inside some microencapsulated products may be poured down the large-bore enteral feeding tube after being removed from the capsule, providing that the pellets are not crushed. Medications given in this manner include diltiazem (cardizem CD, Cardizem SR) ferrous gluconate (Fergon), pancreatic enzyme, nizatidine (Axid) and verapamil (Verelan).

Proton pump inhibitor present as a special dilemma. Omeprazole (Prilosec), Lansoprazole (Prevacid) and esomeprazole (Nexium) are formulated as delayed-release capsules containing enteric-coated granules. Omeprazole and Lansoprazole granules should be mixed with appropriate diluent, such as apple and orange juice, to ensure that maximal amounts of drug reach the duodenum.

In patients with large-bore NG or G tube, the granules can be mixed with acidic fruit juice and the mixture can be poured down the tube then flushed with additional juice. In patients with intestinal feeding tube, oral PPI suspensions should be given by mixing the granules in sodium bicarbonate 8.4% solution.

Lansoprazole is also available as a packet of granules that are mixed with water before administration to form a suspension. However, this product is not appropriate for administration via enteral tubes. The formulation contains xanthan gum, an ingredient that increases the suspension's viscosity and causes it to expand within the feeding tube, increasing the risk for tube blockage. Pantoprazole and rabeprazole are enteric-coated tablets and cannot be split, chewed, or crushed; these medications should not be administered via feeding tubes.



Considerations with Liquid Medications

Liquid dosage forms are preferable if medication must be given via the enteral feeding tube. The medication dosage or frequency may need adjustment when switching from solid to liquid preparations. For example, phenytoin capsules are extended-release products and may be given once daily; phenytoin suspension is an immediate-release product and must be dosed 2 to 4 times daily. Extended release diltiazem tablets may be given once daily, but immediate-release diltiazem tablets must be given 4 times daily. In some cases feeding rate or schedule must be adjusted to ensure adequate nutrition, especially if adequate nutrition is interrupted several times daily for medication administration.

Additionally, diarrhea, cramping, abdominal distention may occur after administration of hyperosmolar products through the feeding tube. Many liquid medications have high osmolalities, to reduce the previously stated side effects it is important to dilute medications with 10 to 30 mL of sterile water before administration.

**Table 1: Commonly Used Oral Dosages
Forms That Should Not be Crushed**

Drug and Dosage Form	Reason
Albuterol: Volmax, Proventil Repetabs	Sustained-release
Enteric-Coated Aspirin	Enteric-coated
Brompheniramine: Lodrane LD, Respahist	Sustained-release
Bupropion: Wellbutrin SR, Zyban	Sustained-release
Carbamazepine: Carbatrol, Tegretol XR	Sustained-release
Carbidopa/Levodopa: Sinemet CR	Sustained-release
Cefaclor: Cefaclor CR	Sustained-release
Cefuroxime: Ceftin	Taste
Ciprofloxacin: Cipro	Taste
Diclofenac/misoprostal: Arthotec	Enteric-coated
Diflunisal: Dolobid	Irritant
Diltiazem: Cardizem CD, Cardizem LA, Cardizem SR, Cartia XT, Dilacor XR, Tiazac	Sustained-release
Disopyramide: Norpace CR	Sustained-release
Divalproex sodium: Depakote ER	Sustained-release
Divalproex sodium: Depakote Sprinkle, Depakote	Enteric-coated
Enalapril: Lexxel	Sustained-release
Ergocalciferol: Drisdol (capsule)	Liquid-filled capsule
Ergotamine: Ergomar	Sublingual product
Esomeprazole: Nexium	Sustained-release
Felodipine: Plendil	Sustained-release
Ferrous Sulfate	Enteric-coated
Finasteride: Propecia, Proscar	Teratogenic
Fluoxetine: Prozac weekly	Delayed-release
Ganciclovir - Cytovene	Irritant
Glipizide: Glucotrol XL	Sustained-release
Indomethacin : Indocin SR	Sustained-release
Isosorbide Dinitrate: Imdur, Isosorbide CR	Sustained-release
Lansoprazole: Prevacid	Sustained-release
Lithium: Lithobid	Sustained-release
Mesalamine: Pentasa	Sustained-release
Mesalamine: Asacol	Enteric-coated
Methylphenidate: Ritalin SR	Sustained-release
Metoprolol: Toprol XL	Sustained-release
Mycophenolate: Cellcept	Teratogenic
Naproxen: Naprelan	Sustained-release
Nifedipine: Adalat CC, Procardia XL	Sustained-release
Omeprazole: Prilosec	Delayed-release
Oxybutynin: Ditropan XL	Sustained-release
Pancreatic-enzymes	Enteric-coated
Pantoprazole: Protonix	Sustained-release
Pentoxifylline: Trental	Sustained-release
Potassium Supplements	Effervescent product
Propranolol: Inderal LA	Sustained-release
Quinidine gluconate: Various	Sustained-release
Rabeprazole: Aciphex	Sustained-release
Sodium Valproate: Depakote ER	Sustained-release
Tamsulosin: Flomax	Sustained-release
Venlafaxine: Effexor XR	Sustained-release
Verapamil: Calan SR, Covera HS, Verelan	Sustained-release

Drug Interaction and Incompatibility

Medications and enteral formulas given together may form a precipitate that may cause obstruction of the feeding tube. Some drugs that this may occur with are phenytoin, warfarin and fluoroquinolones. Phenytoin absorption decreases by 50%-75%. Holding the tube feed two hours before and after the dose and flushing the tube each time may decrease this interaction. Warfarin effects may be decreased in patients who receive enteral tube feeds due to reduced absorption and vitamin K antagonism. Most enteral feeds have Vitamin K and block the effects of warfarin. Fluoroquinolones levels are also erratic when given concomitantly with enteral tube feeds. The mechanism is not well elucidated but may be caused by fluoroquinolone binding of divalent cations in enteral feeding giving fluoroquinolones within 2 hours before or 4 hours after enteral formulas.

(Material obtained from Hospital Pharmacy Volume 38, March 2003)



Pharmacy News

1. Starting January 23, the Department of Pharmacy will not accept medication orders that have unacceptable abbreviations based on the new list provided by JACHO. The new list of unacceptable abbreviations include the following:
 - a. "U" for units
 - b. "IU" for international units
 - c. "QD" or "QOD" for daily and every other day, respectively
 - d. Trailing zero (X.0 mg) or Lacking of leading zero (.X mg)
 - e. "MS" or MSO_4 or " MgSO_4 " for morphine sulfate and magnesium sulfate, respectively
2. Medication orders for heparin (5000 units Sub-Q q12h or q8h) or Lovenox® (40 mg Sub-Q daily or 30 mg Sub-Q q12h) for DVT prophylaxis will have an extended duration of 30 days. However, therapeutic doses (1 mg/kg Sub-Q q12h) of Lovenox and intravenous heparin will still be limited to 3 days.
3. Brevibloc (Esmolol®) double strength (20 mg/mL) premixed 100 mL bags will be replaced with the traditional single strength (10 mg/mL) premixed bags. The bags will be available in Pyxis machines and from the Pharmacy.



Pharmacy & Therapeutics Committee News:

Additions to the Formulary

(Memantine) Namenda® is indicated for the treatment of moderate to severe dementia of the Alzheimer's type. The recommended starting dose is 5 milligrams mg once daily, with a recommended target dose of 20 mg/day. Memantine has also been used in the management of Parkinson's disease, dementia, organic psychosyndrome, neuroleptic drug-induced adverse reactions and spasticity. A dosage reduction to 5 milligrams (mg) ORALLY twice daily is recommended in patients with severe renal impairment (creatinine clearance (CrCl), 5 to 29 milliliters/minute (mL/min)). No dosage adjustment is needed in patients with mild (CrCl greater than 50 to 80 mL/min) or moderate (CrCl 30 to 49 mL/min) renal impairment. Most common adverse events reported with Namenda were dizziness, confusion, headache and constipation.

Mycophenolic acid (Myfortic®) are delayed-release tablets, an enteric formulation of mycophenolate sodium that delivers the active moiety mycophenolic acid (MPA). Myfortic® is an immunosuppressive agent. The tablets are smaller-sized tablet (360 mg Myfortic® compared to 500 mg MMF), therefore easier for the patient to take the medication. The release of Myfortic® is mostly in the small intestine which may result in lower incidence of GI side effects. Myfortic® delayed-release tablets and mycophenolate mofetil tablets and capsules should not be used interchangeably because the rate of absorption following the administration of these two medications is not equivalent. The overall efficacy is the same for both formulations. The recommended dose of Myfortic® is 720 mg administered twice daily (1440 mg total daily dose) on an empty stomach, 1 hour before or 2 hours after food intake.

Isosorbide Dinitrate 20 mg /Hydralazine 37.5 mg (Bidil®) is indicated for the treatment of heart failure in addition to standard therapy in self-identified black patients to improve survival, prolong time to first hospitalization for heart failure and improve patient-reported functional status. The initial starting dose is one tablet three times a day. The target dose is the maximum tolerated dose, not to exceed two tablets three times a day. Headache (50%) and dizziness (32%) are the two most frequent adverse events that are reported with this medication.

Twinrix® (Hepatitis A & B vaccine) is indicated for vaccination of persons aged ≥ 18 years against hepatitis A and B. Any person in this age group having an indication for both hepatitis A and B vaccination can be administered Twinrix, including patients with chronic liver disease, users of illicit injectable drugs, men who have sex with men, and persons with clotting factor disorders who receive therapeutic blood products. For international travel, hepatitis A vaccine is recommended for travelers to areas of high or intermediate hepatitis A endemicity; hepatitis B vaccine is recommended for travelers to areas of high or intermediate hepatitis B endemicity who plan to stay for ≥ 6 months and have frequent close contact with the local population. Primary vaccination consists of three doses, given on a 0-, 1-, and 6-month schedule, the same schedule as that used for single antigen hepatitis B vaccine.

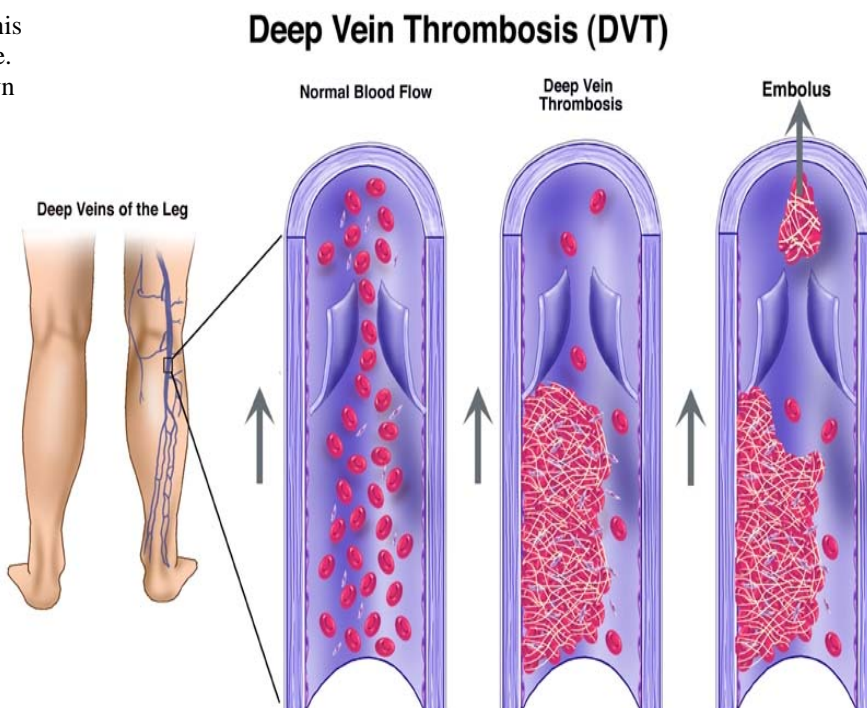
Ketrolac 0.5% (Acular®) and Brimonidine 0.2%, Alphagan® 0.2% two ophthalmic preparations for anti-inflammatory activity and for the treatment of glaucoma respectively, were added to the formulary. The pharmacy will purchase the generic formulation of Alphagan 0.2% solution.

New Deep Vein Thrombosis (DVT)

Prophylaxis Form was recently approved by the Pharmacy and Therapeutics Committee. Clinical Pharmacist, LilyAnn Jeu met with physicians from various departments and has revised the existing DVT prophylaxis form extensively. This new form is a one page form that is easier to use. The clinicians at University Hospital at Brooklyn have worked very hard to achieve almost 100% compliance with DVT prophylaxis. This form will further document the compliance rate, additionally; the DVT prophylaxis form will be included in the initial database of the patient.

Deletions from the Formulary

- Bicillin® CR was deleted from the formulary as it has not been used for many years.



Report on Adverse Drug Reactions for October and December 2005

Diagnosis	Date of Occurrence	Suspected Medication	Dose	Type of Reaction	NS Unit
Steven Johnson's syndrome	10/17/05	Sulfadiazine	1500 mg q6h	Rash & Erythema	62
Steven Johnson's syndrome	10/17/05	Phenytoin	300 mg QD	Rash	62
Pneumonia/ SLE	11/29/05	Ceftriaxone	1g	Swelling of facet of tongue	42
Pneumonia/ SLE	11/29/05	Ibuprofen	400 mg	Same as above	42
Pneumonia/ SLE	11/29/05	Azithromycin	500 mg	Same as above	42
Herpes Zoster	11/12/05	Acyclovir	600 mg q8h	Acute renal failure, Changes in mental status	61