MEDICATION MATTERS
Pharmacy Newsletter

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Just in time to kick off Pharmacy Week (October 18th through October 24th) this year, the Pharmacy Department revives its long lost newsletter. We hope you enjoy this first issue and look forward to the next ones in January, April, July and October of each year. - The Editors

News & Noteworthy:

Levophed® Takes a Stand Post-Code

by LilyAnn Jeu, Medication Safety/Internal Medicine Clinical Pharmacist

After several months of debate, there is finally clarification to the question, "Can Levophed® be given on a med/surg unit?" While considered one of the first-line agents for pressure support post-resuscitation, norepinephrine (brand name Levophed®) has often been overlooked for dopamine (brand name Intropin®), which was removed from code carts years ago. Under ideal conditions, norepinephrine infusion should be administered via central vein access with invasive blood pressure monitoring.

However, post-code or -emergency, norepinephrine may be initiated at the lowest effective dose in the most dilute concentration (4 mg/250 mL) in an adequately perfusing peripheral vein until central venous catheter access is placed. Minimizing peripheral vein exposure reduces the risk of extravasation and local tissue necrosis. Minimizing time to transfer to an intensive care setting facilitates blood pressure monitoring. Similarly, epinephrine infusion (2 mg/250 mL) or calcium chloride 10% (1 gram) may need to be administered via peripheral vein access during emergently code if central line access has not yet been established. New code cart drug dosing charts help clarify these points.

Pharmacy & Therapeutics Committee Updates

by Sarah Jung, Pharmacy Practice Resident

Major updates discussed during the July committee meeting include the addition of liposomal bupivacaine (Exparel®) and the antibiotic ceftazidime/avibactam (Avycaz®) to formulary. Liposomal bupivacaine is a long-acting form of the local anesthetic bupivacaine intended for use to manage post-operative pain. This single injection may take the place of extended infusions of bupivacaine or ropivacaine via On-Q® pain pumps. More information regarding Avycaz® can be found on the next page. In addition, the committee approved the expansion of pharmacists' ability to order drug levels for therapeutic drug monitoring. Once implemented, pharmacists will be able to place orders for vancomycin and aminoglycosides on behalf of physicians after consultation and approval.

September meeting highlights include discussions about e-prescribing (electronic submission of outpatient prescriptions to pharmacies), approval of a new policy allowing dispensing of patient's partially used multi-dose inhalers upon hospital discharge, and approval of additions to the Food and Nutrition dietary formulary. Dietary supplements added were Osmolite 1.0®, Osmolite 1.5®, and Pediasure Peptide 1.5®. Also, use of the supplement Oxepa® is now restricted to patients with acute respiratory distress or lung injury, since its clinical benefit is to modulate the inflammatory response in those patients. Finally, Dr. Stanley Moy was officially hired as the Antimicrobial Stewardship Pharmacist. Within the next few weeks, he will begin working closely with Infectious Diseases department to further develop our antimicrobial stewardship program.

New Drug Primer: Ceftazidime/Avibactam (Avycaz®)

by Yair Fazilov, PharmD Candidate

Ceftazidime/avibactam is a combination of a third-generation cephalosporin and a beta-lactamase inhibitor with broad spectrum antibiotic coverage including *Pseudomonas.* It is FDA-approved for treatment of complicated urinary tract infections alone or in combination with metronidazole for complicated intra-abdominal infections.

- **Indications and Doses:**

Complicated urinary tract infections: 2 grams/0.5 grams infused over 2 hours IV every 8 hours for 7-14 days
Complicated intra-abdominal infections: 2 grams/0.5 grams infused over 2 hours IV every 8 hours for 5-14 days (in combination with metronidazole).
Dosage should be adjusted in patients with CrCl<50 mL/min or on hemodialysis, according to renal function.

- **Contraindications and Precautions:**

Contraindicated with serious hypersensitivity to cephalosporin drugs.
Caution in patients with penicillin allergy, C. difficile- associated diarrhea, and CNS disorders (seizures, non-convulsive status epilepticus, encephalopathy, and coma).

- **Major Adverse Reactions:**

Common: Constipation, nausea, vomiting, and anxiety
Serious: *C. difficile*-associated diarrhea, hypersensitivity, and neurological reactions

- **Restrictions:**

Ceftazidime/avibactam requires Infectious Diseases approval.

More Formulary Updates

by Laurie Ferguson, Pharmacy Informatics Specialist

Deletions
Flunisolide (Aerobid®) oral inhaler
Multivitamin w/Iron (Poly-Vi-Sol® with Iron) for infants
Multivitamin w/Iron Chewable tablets for children
Penicillamine (Cuprimine®) capsules
Penicillin G benzathine + Penicillin G procaine (Bicillin CR®)
Pirbuterol (Maxair®) oral inhaler
Scopolamine (Hyoscine®) vials
Vitamin A+C+D w/Iron (Tri-Vi-Sol®) solution for infants
Vitamin E solution

Changes to Non-Formulary Status
Alendronate (Fosamax®) tablets
Carbamazepine extended release (Carbatrol®) capsules
Conjugated estrogen (Premarin®) tablets
Didanosine delayed-release (Videx EC®) capsules
Fluphenazine decanoate (Prolixin Decanoate®) vials
Haloperidol decanoate (Haldol Decanoate®) vials
Nebivolol (Bystolic®) tablets
Promethazine w/codeine (Phenergan with Codeine®) solution
Sirolimus (Rapamune®) tablets and solution
Stavudine (Zerit®) capsules and solution
Vitamin A+C+D (Tri-Vi-Sol®) solution for children

Major Drug Shortages
None

Technology Updates

by Sarah Jung, Pharmacy Practice Resident

Pyxis® automated dispensing cabinets (ADCs) have been a cornerstone of dispensing medications at University Hospital of Brooklyn since 2002. Access from the nursing station (NS) allows nurses to remove first doses, controlled substances, and as-needed ("prn") or emergency medications without waiting for deliveries from the Pharmacy Department. With the phase-in of Pyxis Profile starting in 2010, access to medications became limited to only those medications with active orders according to the interfaced HealthBridge medication profile per patient and medications approved on the hospital override list.

Over the past several months, expanded or additional cabinets have been added to high-volume patient-care areas including the Medical Intensive Care Unit, Cardiac Progressive Care Unit (on NS 81), NS 73 and NS 61. The addition of these Pyxis® machines has allowed for the shift from cassette fill and cart fill delivery to a "Pyxis dispensing model." In addition to ease of access for nurses, additional benefits afforded by using Pyxis® include: accurate dispensing of correct quantity to correct patient, less wastage, streamlined billing, ease of adjusting medication orders depending on new or changed orders, and increased safety by tracking expired drugs and high-risk medications.

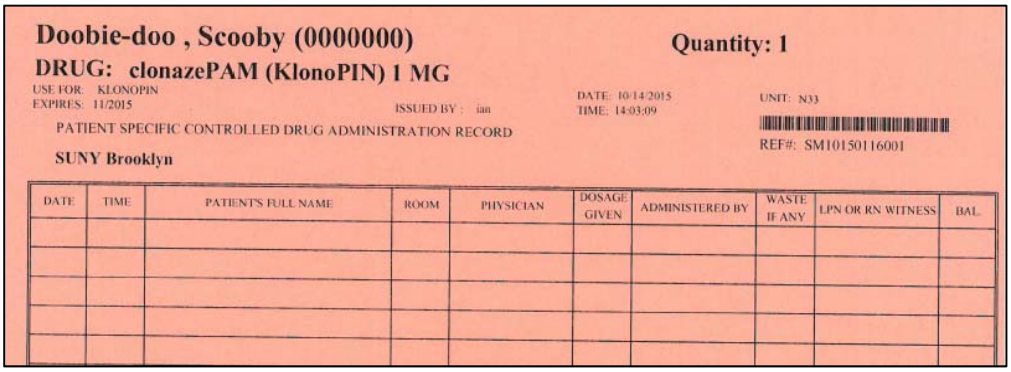
To further improve nursing workflow, accountability and ultimately patient care, properly credential long-term agency nurses may now directly access controlled drugs from Pyxis® for patients.

Pharmacy Focus:

New Procedures for Manually Dispensed Controlled Substances

by Sarah Jung, Pharmacy Practice Resident, and I. Ian Richards, Pharmacy Supervisor

Did you know there are new procedures for logging dispensation and administration of controlled substances stored in double-locked cabinets? To comply with new regulations and to improve efficiency in managing inventory, new C II Safe-generated forms with barcodes and preprinted patient and medication details (see example below) are sent with all manually dispensed controlled substances. This new form requires the signature of the dispensing pharmacist and the receiving nurse. After each dose has been administered to the patient, the nurse logs the date and time of administration. After completion of all dispensed doses, the form can be returned to the securely locked Pyxis® returns bin located in each nursing station. *(Please do not send forms via campus mail or through the chutes!)* Converting to barcodes and electronic tracking enhances the hospital's ability to meet regulatory standards, while improving both nursing and pharmacy workflow.



Doobie-doo , Scooby (0000000) **Quantity: 1**

DRUG: clonazePAM (KlonoPIN) 1 MG

USE FOR: KLONOPIN
EXPIRES: 11/2015
ISSUED BY : ian
DATE: 10/14/2015
TIME: 14:03:09
UNIT: N33
REF#: SM10150116001

PATIENT SPECIFIC CONTROLLED DRUG ADMINISTRATION RECORD

SUNY Brooklyn

DATE	TIME	PATIENT'S FULL NAME	ROOM	PHYSICIAN	DOSAGE GIVEN	ADMINISTERED BY	WASTE IF ANY	LPN OR RN WITNESS	BAL

Featured patient-care question from nurses or patients

Nurses Want To Know …

Q: Why are there so many orders for IV push medications on the floors?

A: *In February 2015, the list of medications nurses can administer via IV push route expanded to more than 30 medications on the medical/surgical units and over 50 medications in progressive and intensive care units for adult and pediatric (non-neonatal) patients. Reasons for the change in practice include faster onset of treatment (usually1-2 minutes instead of after a 15- or 30-minute infusion), less preparation time and hospital cost-savings on the IV tubing and bag per dose. To promote safe prescribing and administration, dose limits and injection rates appear in medication order notes.*

Spotlight on Safety: Smart Response to Smart Pump Alert

by LilyAnn Jeu, Medication Safety/Internal Medicine Clinical Pharmacist

Zidovudine (brand name Retrovir®) 4 mg/kg q12h IV was ordered for a newborn for the prevention of perinatal HIV transmission. The order was verified by a pharmacist, prepared and dispensed to the neonatal intensive care unit. Upon trying to administer the dose, the nurse received a dose warning alert from the infusion pump. Rather than override the alert, she stopped and consulted another physician and then another pharmacist. It turns out that the initial dose ordered was based on an oral regimen and the IV dose should have been 1.5 mg/kg q6h. By responding appropriately to the alert, the nurse prevented a nearly 3-fold overdose of IV zidovudine for this patient.

At University Hospital of Brooklyn, intravenous infusions (other than patient-controlled analgesia) are administered through Alaris "smart" pumps. What makes them "smart"? For each medication, drug libraries allow setting minimum and maximum limits for drug doses, infusion rates and concentrations, as well as clinical reminders about infusion set-up or patient-care monitoring. Currently, there are 10 different libraries to customize parameters for different adult, pediatric, and neonatal populations – including one for Investigational Drugs. Drug libraries are updated at least 1-2 times per year to add new medications or adjust parameters according to changes in practice or quarterly reports on overrides and alerts. While it is expected that physicians, pharmacists, and nurses review medication orders for appropriate drug regimens, smart pumps can help add another layer of safety at the bedside.

Clinical Pearls:
Take a Step Back with NOACs

by Nicholas Zanelli, PharmD Candidate

Amiodarone is a common antiarrhythmic drug that inhibits the drug efflux transporter P-glycoprotein (P-gp) and the cytochrome P450 enzyme CYP3A4. Rivaroxaban (Xarelto®), a novel oral anticoagulant (NOAC), relies on both P-gp and CYP3A4 for metabolism and elimination.

According to the manufacturer, rivaroxaban should not be used in patients with CrCl 15 to < 80 mL/min receiving combined P-gp and moderate CYP 3A4 inhibitors (such as diltiazem, verapamil, dronedarone, or erythromycin) unless the potential benefit outweighs risks of bleeding.[1] Even among patients with normal renal function, exposure to rivaroxaban may increase by 30-160% with dual inhibitors or moderate CYP3A4 inhibitors.

Although amiodarone is considered a weak inhibitor of CYP3A4[2] and rivaroxaban product labeling does not include specific recommendations for adjusting therapy, a 68-year old CCU patient initiated on both medications developed a GI bleed with bloody stools and coffee ground emesis. The patient was not taking aspirin or other CYP3A4 inhibitors and had no history of GI bleed. However, he did have a history of smoking and ethanol use (without hepatic impairment) and an estimated Cr Cl of 60 mL/min.

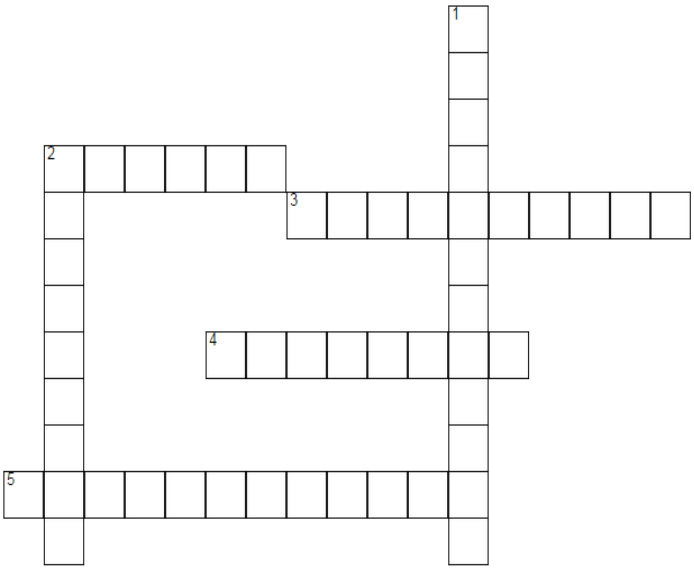
In general, the incidence of GI bleed for rivaroxaban has ranged from 0.5 -3% [1,3] regardless of amiodarone use.[4,5] More specifically, a post-hoc analysis of the ROCKET AF trial did not show an increase in bleeding among patients with CrCl 30 to < 50 mL/min and concomitant use of rivaroxaban with either combined P-gp and/or weak or moderate CYP3A4 inhibitors including amiodarone.[6]

However, as drug interaction potential alone may not be a predictor of bleeding risk, it should be considered in the assessment of patient risk factors for bleeding with anticoagulant therapy.[7]

References:
[1] Xarelto [package insert]. Titusville, NJ: Jansen Pharmaceuticals; 2011. Revised 9/2015.
[2] http://www.fda.gov/Drugs/DevelopmentApprovalProcess/DevelopmentResources/DrugInteractionsLabeling/ucm093664.htm. (Accessed Oct 2015).
[3] *Clin Cardiol.* 2015; 38 (2): 63-68.
[4] *European Heart Journal* (2014); 35: 3346-3355.
[5] *J Am Coll Cardiol.* 2013;61: 1998–2006.
[6] *Heart Rhythm.* 2014; 11(6): 925–932.
[7] *Cerebrovasc Dis.* 2013;36: 115–119.

Crossword Puzzle: Diabetes

by Yair Fazilov, PharmD Candidate



Across

2. HbA_{1C} should be checked every three _____
3. Type of microvascular complication with uncontrolled diabetes affecting nerve endings
4. Type 1 diabetes is also known as _____ diabetes
5. Medication contraindicated in patients with CHF Class III and IV

Down

1. Class of medication which stimulates release of insulin from pancreatic beta cells
2. Medication contraindicated in patients with serum creatinine > 1.5 mg/dL or temporarily after receiving IV contrast media

Answers to Crossword Puzzle:
Across: 2. Months 3. Neuropathy 4. Juvenile 5. Pioglitazone
Down: 1. Sulfonylurea 2. Metformin

Team Tip of the Day

PREVENT DUPLICATE DOSING

Physicians and pharmacists:
When renewing medication orders, remember to check the start date and time of new orders so that medications are not given too early.

Nurses: Remember to check the date and time of the last administered dose for the same or previous order.

Medication Matters is the quarterly pharmacy newsletter at SUNY Downstate Medical Center, published every January, April, July and October. Please submit any suggestions or comments to ljeu@downstate.edu.