Formulary Addition/Deletion

1. Lacosamide (Vimpat®) – formulary addition
   Lacosamide is an anti-epileptic medication that is FDA approved for adjunctive treatment of partial onset seizures in patients 17 years or older. – Formulary addition of lacosamide not deemed necessary at this time.

2. Regadenoson (Lexiscan®) – formulary addition-approved
   Regadenoson is an A2A adenosine receptor agonist used as a pharmacologic stress agent in radionuclide myocardial perfusion imaging. – Formulary addition of regadenoson approved with restrictions to patients with mild-moderate reactive airway disease and underlying cardiac arrhythmias.

3. Homatropine hydrobromide (Isopto® Homatropine) 2% and 5% Ophthalmic drops - discontinued by the manufacturer. Formulary deletion-approved

4. Scopolamine hydrobromide (Isopto® Hyoscine) ophthalmic drops discontinued by manufacturer. Formulary deletion-approved

5. Inhaled Mannitol (Aridol ®) – Formulary addition – approved
   The Committee reviewed the formulary addition request for inhaled mannitol (Aridol®) indicated for the assessment of bronchial hyperresponsiveness in patients 6 years of age or older that do not have clinically apparent asthma.

6. Methacholine (Provocholine®) - Formulary Deletion – approved

7. Chemotherapy Formulary Deletions – approved
   The following medications were recommended to be deleted from the formulary by the Oncology Subcommittee due to low usage or no usage:
   - chlorambucil 2mg po tab
   - etoposide 50mg po cap
   - thioguanine 40mg tab
   - lomustine 10mg, 40mg and 100mg capsules

8. Bupivacaine liposomal injection (Exparel®) – denied
   Bupivacaine liposomal injection in a long-acting formulation of an amide local anesthetic FDA approved for postsurgical analgesia. Formulary addition not deemed necessary at this time.

9. Nitroprusside Injections – approved
   Line extension addition for nitroprusside 50mg/2mL and deletion of nitroprusside 50mg/mL, which is not commercially available, were proposed. Addition of 50mg/2mL and deletion of 50mg/mL – Approved

10. Multiple vitamin oral preparation for renal patients
    Pharmaceutical Care Division proposed line extension for Nephro-Vite® or generic at a cost of $0.08/dose; as well as deletion of Strovite® ($0.60/dose), Strovite Plus® ($0.89/dose), NephroCap® ($0.33/dose), Nephro-Vite Rx® ($0.12/dose), Berocca or any other vitamin B Complex plus C. Addition of Nephro-Vite® or generic onto UH formulary & therapeutic interchange for any renal MVI to Nephro-Vite® were approved

11. Esmolol 2500mg/10mL Deletion
    Pharmaceutical Care Division proposed formulary deletion of esmolol 2500mg/10mL injectable vials due to manufacturer discontinuing production of this strength. Deletion of Esmolol 2500mg/10mL inj. vials – Approved
Policies and Procedures/Floor Stock Update

1. **707-400-108 Resuscitation Equipment Checks & Exchanges – Policy Revision**
The policy is revised to include two Cardiac Cathlab kits under emergency boxes. One kit will be maintained in the Cardiac Cathlab and other will be maintained in the Pharmacy Department for exchange, once the former is used/expired. This revised policy incorporates updates in content and location of code carts at University Hospital. There are currently 28 pediatric code carts and 55 adult code carts.

2. **707-600-166 Labeling Medications, Medication Containers, and Other Solutions in the Perioperative and Other Procedural Settings – Policy Revision**
The policy is revised to specify that the circulating nurse/physician/scrub person must verify that any IV admixture is not prepared for more than one hour prior and is used within 24 hours of the preparation (unless an earlier expiration time is recommended by the manufacturer).

Surface testing and air flow testing policy were submitted for member review and approval.

This new policy delineates the new pharmacy IV room cleaning and testing P&P.

5. **IV Medication Administration Guideline – Revision and Annual Approval**
Revised to include administration of argatroban on all the hospital units, clevidipine by Anesthesia in the OR setting only, dobutamine and dopamine in stepdown/telemetry units at a rate not exceeding 10mcg/kg/min and 5 mcg/kg/min respectively in addition to the critical care/ ACU/ED settings as a continuous infusion.

The policy is revised to reflect that radiopharmaceutical delivery personnel will be accompanied by a Radiology Technologist for after hours/holiday deliveries.

7. **707-800-103 Multidose Vial policy - Policy Revision**
The policy is revised to reflect that the terminology ‘beyond use date’ will be replaced with ‘Use by date’ for the expiration dating of the IV multidose vials once opened.

8. **707-500-121 Labeling & Dispensing of Vinca Alkaloids for IVPB Administration – Policy Revision**
This revised policy incorporates October-December 2013 ISMP quarterly action agenda recommendation on appropriate preparation of vinca alkaloids. Vinca preparations should be dispensed in a IVPB in addition to other preventive measures that we currently observe, including not ordering Vinca preparations on the same ordersheet as intrathecal chemotherapy, not dispensing Vinca preparations with any intrathecal chemotherapy, and not permitting Vinca preparations in a patient care area until lumbar puncture or any intrathecal administration is complete.

This revised policy incorporates the renal MVI automatic interchange to Nephro-Vite® or its generic.

10. **707-600-118 Intravenous Admixture Service – Policy Revision**
This revised policy incorporates updated change in the pharmacy IV Admixture service.
Antipsychotics & Weight Gain: Issue of Non-compliance

One of the most prevalent side effects that encourages non-compliance in antipsychotic medications is the significant weight gain that occurs. A decline in self-esteem and a negative body image forces the patients to halt their use of antipsychotics. In a clinical trial of immediate-release quetiapine for all indications studied in adults, a weight gain of at least 7% of body weight occurs in 8-23% of the patients. In clinical trials for extended-release quetiapine, weight gain of at least 7% of body weight occurred in 10% of those receiving the active drug. Weight loss occurred in only 0.1-1% of patients taking the medication. A medication that is even more known for the side effect of weight gain is olanzapine. In multiple clinical studies, it was found that olanzapine in combination with other medications, such as lithium or valproate, increased weight significantly. In a long term mono-therapy study, the percentages of patients who gained at least 7%, 15%, or 25% of their baseline weight were 64%, 32%, and 12%, respectively.

According to a 2011 report by SUNY Medical Center, patients often gained anywhere from 4 to 37 lbs. A moderate amount of weight gain can result in permanent discontinuation of the medication. Many kinds of anytipsychotics, including Zyprexa®, and some other antidepressant, block activity at the neurotransmitter called 5HT2C, which has been proven to be a trigger for increased eating behavior and obesity in mice. Other types of antipsychotics act on the neurotransmitter beta-3 adrenergic receptors in the fatty tissue, which converts the fat into energy.

Physicians have discovered that prescribing a medication that counteracts the mechanism of action of the antipsychotic would be the best option to prevent weight gain. Medications such as metformin and topiramate are often used to help patients maintain or lose weight. Obesity is a pandemic problem and must be avoided in order to prevent other co-morbidities. The physician should work with his/her patient to find a permanent solution that all parties can feel comfortable with and is easy to implement to avoid non-adherence. Unfortunately, the only way to completely halt the weight gain, without a drastic change in one’s lifestyle, is to taper and then discontinue the medication. For a psychologically unstable person who relies on the medication to maintain a sufficient quality of life, stopping the medication would not be an option. All in all, weight gain is a minor but a significant side effect. If the benefits outweigh the risks, then the medication should be continued and an alternate method to lose weight should be considered.

References:

Contributed by:
Donia Abdelazeem, Pharm. D Candidate 2017, St John’s University
Allergic rhinitis is an IgE-mediated condition in response to allergens in the environment, such as pollen, various insects, and animal dander. Patients may present with either seasonal rhinitis, perennial rhinitis, or episodic rhinitis. The symptoms of allergic rhinitis may seem benign, but they may exacerbate symptoms of other respiratory tract diseases, such as asthma, if not managed appropriately.

To understand the drug methods used to treat allergic rhinitis, it is important to understand the pathophysiology of allergic rhinitis itself. When an antigen enters the nasal cavity for the first time, it is processed by lymphocytes, which in turn produce IgE. After secondary exposure, IgE will interact with the antigen and thereafter bind to mast cells, in turn releasing inflammatory mediators such as histamine and leukotrienes. These mediators stimulate nasal vasodilation, increased vascular permeability, and the accumulation of fluids in the nasal mucosa. From these physiologic effects give rise to the symptoms of allergic rhinitis: rhinorrhea, nasal congestion, sneezing, and also conjunctivitis. The initial onset of symptoms is known as an “immediate phase reaction”, whereas a “late-phase reaction” may also occur some 4-6 hours later, as inflammatory cells then begin to create their own chemical mediators. There are currently six classes of drugs that are approved for allergic rhinitis, many of which are now available over-the-counter (OTC). These agents should be chosen after consideration of the type and severity of each patient’s symptoms.

Nasal steroids are often used as first line agents due to their potency against symptoms of allergic rhinitis, as well as for their activity against the early and late phase reactions. These agents act by reducing inflammatory mediators and chemotaxis in the nasal mucosa, but maximum effects may not be seen for several weeks. Thus, if patients suffer from seasonal symptoms, they should be counseled to take these agents several weeks before the start of the season where their triggers are most common. Patients should also be properly instructed on how to use the inhalers, by inserting the device into the nasal cavity, aiming it toward the eye on the ipsilateral side of the face, and pressing the actuator at the same time as inhalation. Recently, newer formulations have been made to reduce side effects of burning, itching, and epistaxis after use.

Antihistamines are also one of the mainstays of treatment, however they are less potent that steroids. Antihistamines should be taken before allergen exposure for maximal benefit, however tolerance does develop over long-term use. Patients should be counseled to avoid use of alcohol and other CNS depressants, as well as other OTC products that may contain antihistamines. Currently, second generation antihistamines are preferred over first generation agents, such as Benadryl®, because of reduced somnolence.

Nasal decongestants act as agonists of the sympathetic nervous system, primarily causing vasoconstriction to reduce vascular swelling. These agents are predominantly OTC, and come as oral and intranasal formulations, but the latter dosage form causes dependence and rebound congestion after 3-5 days of use. Caution should be exercised if patients suffer from hypertension and if they are taking any medications for blood pressure. Mast cell stabilizers work by preventing the initial release of mediators from mast cells, but they are not as effective as the other agents and must be dosed 3-4 times daily for any therapeutic effect. Montelukast, a leukotriene receptor antagonist, now recently OTC, is primarily useful for seasonal allergic rhinitis. Ipatroprium bromide is the only anticholinergic approved for use in allergic rhinitis, and may prove useful in drying secretions, but may also cause epistaxis as a result of nasal dryness.

<p>| Table 1. Allergic Rhinitis Treatment Based on Symptoms |</p>
<table>
<thead>
<tr>
<th>Treatment type</th>
<th>Ocular Symptoms</th>
<th>Nasopharyngeal itching</th>
<th>Sneezing</th>
<th>Rhinorrhea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intranasal corticosteroids</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Oral antihistamines</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Intranasal antihistamines</td>
<td>—</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Decongestants</td>
<td>✓</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Intranasal cromolyn (Nasalcrom)</td>
<td>—</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Intranasal anticholinergics</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>✓</td>
</tr>
<tr>
<td>Leukotriene receptor antagonists</td>
<td>✓</td>
<td>—</td>
<td>—</td>
<td>✓</td>
</tr>
<tr>
<td>Nasal saline irrigation</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>✓</td>
</tr>
<tr>
<td>Immunotherapy</td>
<td>✓</td>
<td>—</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

NOTE: Listed in order of treatment preference.
### Table 2. Summary of Treatments for Allergic Rhinitis

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Pregnancy category</th>
<th>Minimum age</th>
<th>Mechanism and onset of action</th>
<th>Adverse effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intranasal corticosteroids</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beclomethasone (Beconase)</td>
<td>B</td>
<td>Six years</td>
<td>Inhibits the influx of inflammatory cells; onset of action is less than 30 minutes</td>
<td>Bitter aftertaste, burning, epistaxis, headache, nasal dryness, potential risk of systemic absorption, rhinitis medicamentosa, stinging, throat irritation</td>
</tr>
<tr>
<td>Budesonide (Rhinocort)</td>
<td>C</td>
<td>Six years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ciclesonide (Omnaris)</td>
<td>C</td>
<td>Six years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flunisolide</td>
<td>C</td>
<td>Six years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluticasone furoate (Veramyst)</td>
<td>C</td>
<td>Two years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluticasone propionate (Flonase)</td>
<td>C</td>
<td>12 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mometasone (Nasonex)</td>
<td>C</td>
<td>Two years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triamcinolone (Nasacort)</td>
<td>C</td>
<td>12 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Oral antihistamines</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cetirizine (Zyrtec)</td>
<td>B</td>
<td>Six months</td>
<td>Blocks H1 receptors; onset of action is 15 to 30 minutes</td>
<td>Dry mouth, sedation at higher than recommended doses</td>
</tr>
<tr>
<td>Desloratadine (Clarinex)</td>
<td>C</td>
<td>Six months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fexofenadine (Allegra)</td>
<td>C</td>
<td>Six months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Levocetirizine (Xyzal)</td>
<td>B</td>
<td>12 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loratadine (Claritin)</td>
<td>B</td>
<td>Two years</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intranasal antihistamines</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Azelastine (Astepin)</td>
<td>C</td>
<td>Five years</td>
<td>Blocks H1 receptors; onset of action is 15 minutes</td>
<td>Bitter aftertaste, epistaxis, headache, nasal irritation, sedation</td>
</tr>
<tr>
<td>Olopatadine (Patanase)</td>
<td>C</td>
<td>Six years</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Oral decongestants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pseudoephedrine</td>
<td>C</td>
<td>12 years</td>
<td>Vasoconstriction; onset of action is 15 to 30 minutes</td>
<td>Arrhythmias, dizziness, headache, hypertension, insomnia, nervousness, tremor, urinary retention</td>
</tr>
<tr>
<td><strong>Intranasal cromolyn</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cromolyn (Nasalcrin)</td>
<td>B</td>
<td>Two years</td>
<td>Inhibits histamine release; results typically noted in one week, but may take two to four weeks for full effect</td>
<td>Epistaxis, nasal irritation, sneezing</td>
</tr>
<tr>
<td><strong>Intranasal anticholinergics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ipratropium (Atrovent)</td>
<td>B</td>
<td>Six years</td>
<td>Blocks acetylcholine receptors; onset of action is 15 minutes</td>
<td>Epistaxis, headache, nasal dryness</td>
</tr>
<tr>
<td><strong>Leukotriene receptor antagonists</strong></td>
<td></td>
<td></td>
<td></td>
<td>Elevated levels of alanine transaminase, aspartate transaminase, and bilirubin</td>
</tr>
<tr>
<td>Montelukast (Singular)</td>
<td>B</td>
<td>Six months</td>
<td>Blocks leukotriene receptors; onset of action is two hours</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Listed in order of treatment preference.

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Tables from Surk DK. American Family Physician Allergic Rhinitis Clinical Practice Guidelines (below)

References:

Contributed by:  
Warren Moore, Pharm.D. Candidate 2015, Rutgers University
Before the technological advancement of the 21st century, medication errors were more than prevalent in the United States health system. In 2000, the Institute of Medicine (IOM) reported as many as 98,000 patient deaths due to medication errors alone. In the past, physicians had hand written or verbally communicated their medication orders to pharmacists. Unfortunately, these orders were often incorrectly transcribed via nurses or pharmacy staff members due to reasons such as use of non-standard abbreviations, poor illegibility, etc. Finally in 2007, the Institute of Medicine (IOM) recommended use of a computerized provider order management interface that dramatically changed the health care system.1

With features to warn clinicians of drug allergies, adverse drug reactions, drug interactions, teratogenicity and more, Computer Provider Order Management (CPOM) marks a revolutionary advancement in patient safety capitalization. Not only does it provide important reminders to physicians, but also it suggests alternative therapies due to complications. It can check drug dosages against patient’s physical parameters, laboratory parameters and past medical histories and warn physicians of any potential issues. Besides serving as an informational drug database, CPOM also minimizes order forgery and fraud by using electronic signature codes, ID scanners and fingerprint readers to verify physician identification. It can also limit providers to types of orders based on his or her scope of practice and privileges. Furthermore, the CPOM software greatly improves order entry efficiency, which is an ongoing topic addressed in every hospital. 2,3,4

Although the introduction of CPOM is a sound step towards medication error minimization, it does present its own risks and disadvantages. The installation of computers and programming of software in large hospitals can be expensive and time consuming. A majority of staff members would need to be educated on using the new software. Frequent alerts and warnings can interrupt workflow. Additionally repeated overrides of these messages can lead to unconscious mistakes and important warnings to be accidently ignored.2,4

Nevertheless, IOM published studies have shown CPOM implementation to reduce rates of medication errors by over 80%, and reduce medication error related deaths by over 55%. Prescription ordering errors are the largest identified source of preventable hospital medication error, and CPOM has done a great job addressing this issue. Not only has it significantly improved patient safety, but also it enhanced both the efficiency of order entry and order verification. Today, both the CMS and CDC are pushing for further CPOM implementation in hospitals across America.1,2

References:

Contributed by:
Weihao Xie, Pharm.D. Candidate 2016, St. John’s University
In the modern health care systems, where drug therapy is the most common intervention, access to the right medication for the right patient in a timely manner is paramount. While improvements have been made to prescribing practices, primarily through the use of efficient information technology, many patients from rural areas, long-term care facilities, and those recently discharged from hospitals continue to encounter difficulty accessing prescription medications. Current practices do not meet patients' needs in terms of cost-effective, timely, and convenient access to prescription medications. The most common healthcare provider that patients visit is the pharmacist. Thus, pharmacists are the logical choice to facilitate ease of access to medications via prescribing rights.

Pharmacists in New Mexico, Montana, North Carolina, North Dakota, and California have been granted "mid-level practitioner" status (MLP), permitting them to obtain DEA registration numbers. Additionally pharmacists have established Collaborative Drug Therapy Management agreements with physicians. These agreements allow pharmacists to initiate drug therapy under the supervision of a physician. To qualify for the Pharmacist Clinician Certification and subsequently apply for prescription writing privileges and a DEA number, New Mexico pharmacists must undergo a substantial amount of additional education. This includes diagnosis and physical assessment training equivalent to what is required for physician assistants.

Advanced Practitioner Pharmacists decrease costs for both patients and the U.S. health care system overall. On average $37,200 is saved per month by advanced practitioner pharmacists, which covers the cost of the services provided by the pharmacists. Despite these benefits, there are still obstacles in implementing programs that allow pharmacists to help prescribe under Collaborative Drug Therapy Management with physicians. Some of these obstacles include reimbursement challenges, patient acceptance and awareness, and proper planning and implementation. The benefits provided by pharmacists for patient care outweigh the costs of incorporating these programs into regular practice.

References:

Contributed by:
Raj Kalaria, Pharm. D. Candidate 2016, Rutgers University
Metronomic Therapy: Potential Alternative or Adjunct to Conventional Chemotherapy

Conventional chemotherapy regimens are cyclic and rely on administering maximum tolerable doses of cytostatic or cytotoxic drugs. This approach necessitates a period of rest and recovery for the patient’s immune system and can eventually contribute to the development of resistance. Additionally, patients must deal with debilitating side effects and/or inadequate therapeutic results. Metronomic chemotherapy, which involves the administration of continuous, low dose agents, has become an experimental treatment option. It has been shown to be less toxic and at least as effective in treating certain cancers, especially when used in combination with other targeted therapies.

Metronomic therapy uses an antiangiogenic approach to cancer therapy through various mechanisms. The destruction of endothelial cells that form the lining of new blood vessels prevents tumors from growing.\(^1\) Immune system activation involves inhibition of TREG cells and maturation of tumor-infiltrating dendritic cells by certain drugs such as cyclophosphamide and paclitaxel, respectively. The induction of senescence in tumor cells is also a theorized mechanism by which metronomic therapy can have effects.\(^2\) Metronomic therapy regimens could include anti-cancer drugs in combination with non-cytostatic or cytotoxic drugs.\(^2\) For instance, one studied regimen included fenofibrate, a PPAR\(\alpha\) agonist with some anti-angiogenic effects, and celecoxib, a COX-2 inhibitor with anti-inflammatory and anti-angiogenic properties, as part of a five drug regimen to treat children with recurrent or progressive cancer.\(^3\) Thalidomide, etoposide and cyclophosphamide rounded out the oral drugs given as metronomic therapy with weekly chemotherapy. COX-2 inhibitors affect apoptosis, can increase intracellular concentrations of doxorubicin, and can dose dependently reduce the development of adenocarcinomas.\(^2\) Similarly, the effect of metformin on signaling pathways involved in cancer growth is another current area of discussion.\(^2\)

Many early stage clinical trials have been conducted since the metronomic approach was proposed and tested in animals years ago. The largest trials, including almost 500 patients total, involved advanced breast cancer patients and showed metronomic therapy as an effective approach when used alone or in combination with bevacizumab, trastuzumab or letrozole.\(^4\) Other studies presenting promising results involve metronomic regimens for ovarian cancer, hormone-resistant prostate cancer, as a salvage therapy for relapsed or refractory multiple myeloma, recurrent non-Hodgkin’s lymphoma, recurrent malignant glioma and glioblastoma, and head and neck cancers. Phase III trials have not yet been conducted in the United States, but one Japanese phase III study showed an increase in overall survival in patients with lung adenocarcinomas when metronomic therapy was used as an adjunct to tumor resection.\(^4\) Although patient survival is not always significantly prolonged, tumor stabilization and overall response in refractory or relapsed cancer are reasons for optimism. Still, current findings are inconclusive as not all trials have yielded promising results. Once more definitive evidence is established, metronomic therapy could find its place in clinical settings. It could perhaps be reserved for specific instances, such as treating more indolent, (Continued on page 9)
Metronomic Therapy: Potential Alternative
(Continued from page 8)
slow growing tumors that allow for more time for the patient or as salvage therapy.

Although efficacy of metronomic therapy is not fully established, it was designed to minimize toxicity. The majority of associated side effects, such as nausea, vomiting, and neutropenia are low grade in scale. It must be taken into account, however, that current data does not include a large number of patients, and the combination with various targeted drugs can change the toxicity profile of typical regimens. Prolonged metronomic therapies may lead to high levels due to accumulation of these drugs. This could theoretically result in secondary leukemia or resistance to the therapy.2,4 Additionally, caution must be used when treating children because of the role of angiogenesis in growth, even if tumor mechanisms differ from natural physiologic mechanisms. Despite these concerns, the tolerability of metronomic regimens has been documented.

Metronomic chemotherapy is currently experimental and requires further investigation. Essential facets need to be determined including the number and type of agents, dosing and administration strategies, and biomarkers and other instruments for patient selection and stratification. This is especially necessary due to patients’ differing responses based on tumor type. Still, several clinical trials have exhibited its potential efficacy as part of combination, adjuvant, or salvage therapy for certain cancers. As cancer continues to be a prevalent health issue worldwide, the study of new, innovative approaches to chemotherapy, such as metronomic chemotherapy, is critical to improving patient care.

References:

Contributed by: Uzma Ahmed, Pharm. D. Candidate 2016, Rutgers University

Impact of CMS Readmission Reduction Program on Pharmacy

In attempts to reduce the readmission rate for previously hospitalized patients, the Centers for Medicare and Medicaid Services (CMS) is in the process of implementing its Hospital Readmission Reduction Program (HRRP). Starting in October of 2012, CMS has defined a readmission as an admission to any hospital within 30 days of discharge.2 Readmission to hospitals within 30 days occurs in approximately 19.6% of Medicare patients.1 This frequency increases to 34% when the time frame is expanded to 60 days.1 In 2004, this translated into a cost of roughly $17.4 billion for hospital readmissions.1 As of now, the only diagnoses that the HRRP applies to are acute myocardial infarction (AMI), heart failure (HF), and pneumonia (PN).2 The conditions reviewed under the HRRP are set to expand in 2015 to also include acute exacerbations of chronic obstructive pulmonary disorder (COPD), total hip arthroplasty (THA), and total knee arthroplasty (TKA).2 Therefore, high rates of readmission for any of these diagnosis related groups will drastically affect a hospital’s financial standing.

With the importance of reducing hospital readmissions rising, an emphasis on patient counseling has also grown. A study that looked specifically at congestive heart failure patients found a significant decrease in readmissions when patients received counseling. After comparing the results from the two treatment arms, those who received counseling and those who did not, there was an absolute reduction of 13.2%.3 This reduction translated into a cost of care reduction of $307 per patient per month.3 According to the recently updated American College of Cardiology

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Impact of CMS Readmission Reduction

(Continued from page 9)

Foundation/American Heart Association (ACCF/AHA) heart failure guidelines, there is a substantial decrease in unplanned emergency admissions and readmissions for patients that were counseled.4 This resulted in the ACCF/AHA including patient discharge counseling in the heart failure guidelines.4 Similar recommendations have been made in guidelines for both acute myocardial infarction and community acquired pneumonia.5,6

As the Affordable Care Act continues to grant more United States citizens with health insurance, the cost of health care is inevitably going to increase. Additionally, each year the primary care physician shortage increases and leaves a larger gap in patient care that must be accommodated. Ultimately, as the cost of health care rises, preventing unnecessary expenditures, such as hospital readmissions, will become the responsibility of all health care professionals. Being the “drug experts” of the health care world gives pharmacists the expertise to lead the medication reconciliation sessions and lead to the improvement in patient care outcomes and quality of life.

References:

Contributed by:
Alexander Mozeika, Pharm.D. Candidate 2016, Rutgers University

(Continued on page 11)
Clinical Pharmacist Care in the Surgical Setting
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during the postoperative period" such as prescribing wrong drugs and dosages, or even inappropriateness of restarting home medications. Standard care involved nurses at the pre-admission clinic who obtained medication histories of the patients from their surgical preadmission clinic or occasionally over the phone. The intervention group involved pharmacists gathering a comprehensive medication history through interviewing the patient, assessing the patient’s current home medication regimen, and generating a preprinted, postoperative medication order form for preoperative home medications to reduce discrepancies of medications. The results of this study show that 41 out of 202 (20.3%) patients had at least one discrepancy in the intervention group compared to 86 out of 214 (40.2%) patients in the standard care group who had at least one discrepancy. This is a significant reduction in medication discrepancies due to the involvement of a clinical pharmacist in a pre-admission clinic.

A specific example where a clinical pharmacist is essential in the surgical setting would be in the bariatric treatment process. With obesity being a major cause of concern for the population, bariatric surgeries are becoming more prevalent. In preoperative care, the pharmacist has an important role in identifying and assessing many physiological factors (i.e. weight, cardiac output, levels of serum lipoproteins, cholesterol, etc.) in order to properly recommend appropriate doses of medications. They are also involved in creating preoperative protocol which provides correct prophylactic treatments for patients heading into surgery. The role of a pharmacist in postoperative care also determines the outcome of the bariatric surgery. Postoperative medication management is crucial for a patient’s successful recovery from the surgery. This includes recommendations on the best medications to give directly after surgery, as well as making sure the routes of administration of these medications are the easiest for the patient. As the patient’s condition improves, so will many of his or her physiological factors such as blood pressure and glucose levels. The pharmacist should be aware of this and make the appropriate recommendations to the patient’s physicians.

The importance of clinical pharmacist care in the surgical setting is becoming more recognized and sought after. Surveys were taken of approximately 70 nurses on the surgery wards of hospitals in Canada under the Capital Health domain nine months before and after the implementation of clinical pharmacist care in general and gastrointestinal surgery wards. Many of these nurses pointed out that the addition of clinical pharmacists had a positive impact on their own roles and responsibilities as nurses. At least 85% of nurses surveyed indicated that the clinical pharmacists’ care met or exceeded their expectations. An observational study conducted by the same coordinator as the nurses’ survey shows clinical pharmacists’ impact on postoperative care not only significantly reduced the amount and severity of adverse drug events, but also cut additional costs for the patient and the hospital. In the study, the pharmacists made 1097 interventions in six months. A quarter of these interventions held a 40% or greater chance of preventing an adverse drug event. The pharmacists’ interventions avoided an additional 867 days in the hospital for surgical patients.

Overall, the importance of clinical pharmacist care in the surgical setting cannot be understated. The knowledge and skills that they bring to the health care team are necessary and instrumental to patient care. Hospitals and other health care service providers should look to utilize pharmacists and their understanding of medications to expand the range of care and safety of patients who undergo surgery.

References:

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Warfarin is a drug therapy that has been primarily linked with the treatment or prophylaxis of thromboembolic complications. Traditionally, warfarin is used as prophylactic treatment for the formation of blood clots and embolisms, or can be used as treatment to help prevent clots from becoming larger and lethal.

As an anticoagulant, its mechanism of action prevents the overall clotting of the person's vasculature. Treatment is generally monitored and adjusted by measuring a patient's International Normalized Ratio (INR), which utilizes prothrombin time, or a patient's ability to clot his or her blood. However, new observational findings indicate that warfarin could potentially have other uses, such as for the treatment of schizophrenia.

Schizophrenia has, like other psychiatric illnesses, remained a highly controversial topic in terms of its cause and treatment. Various hypotheses of how schizophrenia develops are currently being studied. One of the most popular theories to its development involves excessive dopamine levels leading to abnormal neuronal activity. Evidence that supports these claims are due to the fact that many of the medications used to treat schizophrenia, such as haloperidol and clozapine, decrease dopaminergic levels by acting as dopamine receptor antagonists. As a result, the reuptake of dopamine is prevented, thereby decreasing schizophrenic symptoms.

Despite the popularity of the use of antipsychotics in patients suffering from schizophrenia, these medications also cause numerous side effects such as obesity, sedation, development of diabetes, agranulocytosis, etc. It has become clear through the use of these medications during the past few decades that a safer alternative is desired. Early studies have shown that patients who suffer from schizophrenia and receive warfarin treatment show not only a decrease in schizophrenic symptoms, but also a decrease in the need for antipsychotic medications. If further studied and confirmed, the medical philosophy towards treating schizophrenia and other psychotic disorders could change drastically.

The findings were reported at an anticoagulation clinic located at the Federal University of Rio de Janeiro in Brazil where nearly 350 patients received long-term treatment of warfarin for recurrent deep vein thrombosis or DVT at a time. Recently, of the patients receiving therapy, five were found to also suffer from schizophrenia. When the lead physician, Dr. Silvia Hoirisch-Clapauch, reviewed their progress throughout the length of therapy, she found that all five not only showed a decline in psychotic symptoms, but also no longer displayed a need to continue any psychotropic medications for approximately 2-11 years.

The question now is to determine the mechanism responsible for the possible link between the reduction of schizophrenia symptoms and warfarin. Research has indicated that schizophrenic patients have a decreased hippocampal volume. As a result, neuronal plasticity, or the capability of the nervous system to respond and adjust to any environmental stresses, trauma, or disruption of the normal homeostasis, is compromised.

Further research in 2012 indicated that tPA, or tissue plasminogen activator, could be the common link between treating thromboembolic events as well as increasing neuronal plasticity and increasing hippocampal volume. The five patients treated in the Brazilian anticoagulant clinic were initially found to have low levels of tPA. Further research has indicated that low levels of tPA can lead to abnormalities in the neuronal system such as poor conduction of dopamine.

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New Bill Allows EMTs to Administer Narxone

Overdose is now the leading cause of accidental death in New Jersey, surpassing motor vehicle accidents, falls, and drowning.¹ There were approximately 4,300 drug-related deaths in the state of New Jersey from 2010-2013.² One theory explaining the extensively high heroin overdose rates is that patients are getting addicted to prescription pain killers, such as oxycodone, that may be over prescribed. When these medications become too expensive or users cannot get their prescriptions filled as frequently as they wish, they turn to illegal methods of purchasing drugs, such as heroin, a much less expensive alternative. Overdose is also a big problem among teens that are trying heroin for the first time, as they are not fully aware of the dangers of its effects.

In severe cases of opioid overdose, the amount of time to get treatment is critical to the survival of the individual. Some patients may not make it to the hospital to receive the antidote, and unfortunately can pass away in their homes or in the ambulance. This past March, Governor Christie signed a bill that will allow EMTs to administer the opioid antagonist, naloxone.

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New Bill Allows EMTs to Administer Naloxone
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(Narcan®) to individuals who have overdosed.³ Naloxone, which can be administered as an injection, inhalation, or intranasal spray, can reverse the fatal respiratory depression seen in those suffering from an overdose.⁴ Previously, the only medications EMTs were allowed to administer were short acting inhalers, epinephrine injections, and nitroglycerin. Now, they will be able to administer all four of these time-critical and potentially life saving medications. Additionally, The Good Samaritan Emergency Response Act, which was passed last year, allows witnesses of an overdose to not be liable of criminal charges for drug possession if they call for help.¹ These laws raise the likelihood that a patient who has overdosed will get help sooner, thus increasing his or her chance of survival.

Pharmacists can play a great role in the fight against drug abuse by utilizing the NJ Prescription Drug Monitoring Program (NJPMP). The NJPMP is a statewide database that collects data on controlled drug prescriptions being dispensed in New Jersey.⁵ The purpose of the database is to reduce drug abuse. When a pharmacist comes across a patient that has a questionable prescription history, he or she is encouraged to assist the patient in seeking help. Pharmacists can also take on opportunities to educate teachers, parents, and youth in the community about the dangers of drug abuse through various patient outreach projects. Opioid-related deaths are preventable. In addition to education, the recent actions that have been put in place would be able to prevent a large scale of unnecessary mortalities. With the additional 28,000 EMTs able to administer naloxone, the Good Samaritan Emergency Response Act, and NJPMP, the government hopes to see a decline in the number of deaths in New Jersey caused by heroin and other opioid overdoses.²

References:

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Stress Ulcer Prophylaxis in the ICU: PPIs Riskier than H2RAs

Gastrointestinal complications, such as ulceration and bleeding associated with stress-related mucosal disease (SRMD), can occur in critically ill patients admitted to the intensive care unit (ICU). SRMD is an acute erosive gastritis, which may develop within 24 hours of admission to the ICU. A multitude of factors are involved in SRMD, including abnormal inflammatory responses, hypotension, hypovolemia, reduced cardiac output, and splanchnic hypoperfusion resulting in mucosal ischemia and damage.¹

Stress ulcer prophylaxis is important for at-risk critically ill patients to help protect against bleeding and minimize complications associated with SRMD. Independent risk factors for clinically significant bleeding include respiratory failure requiring more than 48 hours of mechanical ventilation and coagulopathy. Other potential risk factors include recent major surgery, multiple trauma, severe burns, hepatic/renal disease

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Stress Ulcer Prophylaxis in the ICU: PPIs Riskier than H2RAs

 upon admission, sepsis, hypotension, neurologic trauma, multiple organ failure, and high-dose corticosteroids. Prophylactic treatment should be initiated in patients with at least 1 independent risk factor or at least 2 other risk factors in the ICU setting.\(^1,2\)

Pharmacologic agents used for stress ulcer prophylaxis include antacids, sucralfate, histamine 2 receptor antagonists (H2RAs), and proton pump inhibitors (PPIs). Antacids neutralize acidic contents of the stomach but are not recommended for use due to frequent dosing and increased risk of aspiration pneumonia and toxicity. Sucralfate forms a protective barrier between the mucosa and gastric acid in the stomach lumen but may reduce absorption of medications concomitantly administered. H2RAs inhibit histamine-stimulated acid secretion by reversible, competitive inhibition of H2 receptors involved with gastric secretion on parietal cells. PPIs inactivate H+K++-ATPase, resulting in reduced gastric acid secretion. H2RAs and PPIs are the two most common classes of medications administered in the ICU for stress ulcer prophylaxis.\(^1,2\)

Results from a new study recently presented at the Society of Critical Care Medicine 43rd Critical Care Congress on January 11, 2014 indicate that critically ill patients exhibit a greater number of adverse events when receiving PPIs compared to H2RAs. It is a common practice to administer a PPI or H2RA as prophylaxis in the ICU to prevent bleeding that may result from stress ulceration. PPIs are more often prescribed than H2RAs, often times being misused and overused. From July 2009 to February 2013, medical records of patients admitted to a 54-bed medical-surgical ICU were analyzed. 14,280 patients received stress ulcer prophylaxis: 3,681 (43%) received a PPI and 4,881 (57%) received a H2RA. 5,718 patients were excluded for receiving acid suppression therapy prior to admission, not receiving stress ulcer prophylaxis in the ICU, or receiving both a PPI and a H2RA. However, researchers found that an indication for prophylaxis only existed in 32.3% of patients who received a PPI and 37.8% of patients who received a H2RA. Results also demonstrated an increased risk for adverse events in patients being administered a PPI. Adverse events such as gastrointestinal bleeding (4.7% vs. 1.1%) and 30-day mortality (6% vs. 3.7%) were significantly greater in patients receiving a PPI than those receiving a H2RA (P-value < 0.0001). Other adverse events include Clostridium difficile infection (1.9% vs. 1.3%, P-value = 0.02) and nosocomial pneumonia (0.29% vs. 0.26%, P-value = 0.8) for PPIs and H2RAs, respectively. It is important to consider the adverse event profiles demonstrated in this most recent study and weigh both the risks and benefits of these medications prior to use in the inpatient setting.\(^3\)

Several factors must be taken into consideration when determining which agent to use, including associated risk factors, the underlying medical illness, and cost. In order to prevent a financial loss and overuse of medications, appropriate and cost-effective care should be provided for all critically ill patients to ensure that patients are neither continued on prophylactic treatment once transferred out of the ICU, nor discharged on acid suppression therapy without an identifiable indication for use.\(^4\)

Collaboration among physicians, pharmacists, and nurses is important to minimize inappropriate use and maintain optimal patient care with the least amount of adverse events.\(^4\)

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Pediatric Hypertension

Diseases which are prevalent within the pediatric population require distinct protocols for treatment accompanied by the utmost care and precision. Pediatric hypertension (HTN) is one disease state in particular that has come to the forefront of medical practice in the United States over the past decade. Reasons for this include an increase in the prevalence of cardiac abnormalities, improvements in diagnosing, and a rise in childhood obesity. It is estimated that 3% to 5% of the pediatric population is currently affected by this condition today.1

Children three years and older should have their blood pressures checked via auscultation at each visit to their healthcare provider, and measured via sphygmomanometer if the reading appears elevated. Childhood HTN is diagnosed based on average Systolic Blood Pressure and/or Diastolic Blood Pressure that is ≥95th percentile on three or more consecutive office visits. One’s blood pressure percentile is calculated based on his/her sex, age, and height.2

Pediatric HTN causes immediate harm to a child, but also has implications on his/her health and well-being in the future. Critical concerns for treating pediatric HTN include avoidance of some non-specific symptoms such as headache, vertigo, nasal bleeding, nausea, and vomiting triggered by hypertensive urgency; and preventing target organ insufficiency brought about by hypertensive crisis. Among the long-term consequences of not treating pediatric hypertension are adult HTN, cardiovascular disease, and a linkage to insulin resistance.2, 3

Non-pharmacologic treatments such as lifestyle modifications can be effective at lowering blood pressure and decreasing risks of cardiovascular disease. The Dietary Approach to Stop Hypertension (DASH) diet is commonly considered for pediatric patients (12 months and older) with HTN. DASH encourages a diet regimen high in fruits and vegetables, non-fat dairy products, fiber, and low amounts of daily sodium consumption. Besides dietary modifications, weight loss for overweight patients, and physical exercise for all patients is recommended. Physical exercise can be performed by the pediatric patient in numerous ways, such as participating in sports, walking, biking, and completing household chores.4, 5

Pharmacologic interventions appear to be the most effective forms of treating pediatric HTN. Since there is limited data regarding the long-term effects of antihypertensive drugs on children’s growth and development, clear-cut indications should be established before initiating therapy. These indications include symptomatic HTN, secondary HTN, established hypertensive target-organ damage, and failure of nonpharmacologic measures.2 Since all classes of antihypertensive drugs have been shown to lower BP in children, it is the physician’s own judgment that dictates which medication to be used to initiate therapy. No matter which class of medication is selected, treatment is initiated at the lowest recommended dose, and titrated upward until the optimal BP is achieved. After the highest possible dose has been reached, or if the patient experiences adverse effects from the medication, a drug from another class is added onto the regimen. The most commonly prescribed anti-hypertensive drugs for pediatric patients fall into four main classes: Angiotensin-Converting Enzyme Inhibitors, Angiotensin Receptor Blockers, Calcium Channel Blockers, and Beta-Blockers. Among the four classes, Angiotensin-Converting Enzyme Inhibitors have the most evidence supporting their use in the pediatric population when treating HTN.6 Although diuretics are commonly used to treat pediatric HTN, no large studies have been performed to date.

Pharmacists can play a large role in the detection and treatment of pediatric HTN. They can record blood pressure, promote healthy lifestyles, collaborate with the physician to select the best course of treatment, and verify correct pediatric doses.5

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