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B • U • L • L • E • T • I • N

FORMULARY UPDATE

The Pharmacy and Therapeutics Committee met May 20, 2008. 4 products were added in the *Formulary*, and 2 products were deleted. 4 products were designated nonformulary and not available; 1 interchange was approved; and, 1 criteria for use was changed.

◆ ADDED

Cefixime Tablet
(Suprax® by Lupin Pharma)

Hexachlorophene Cleanser
(pHisoHex® by Sanofi-Synthelabo)

Ipratropium + Albuterol Solution for Inhalation (Generic)

Sodium Chloride 7% Solution for Inhalation
(Hyper-Sal® 7% by Pari Respiratory)

◆ DELETED

Carbenicillin Tablets
(Geocillin® by Pfizer)*

**Nonformulary and not available (off the market)*

Cefixime Oral Suspension
(Suprax® by Lupin Pharma)

◆ NONFORMULARY AND NOT AVAILABLE

Bimatoprost Ophthalmic Solution
(Lumigan® by Allergan)†

†Interchanged to latanoprost with same dosage (usually 1 drop daily)

Travoprost Ophthalmic Solution
(Travatan® and Travatan® Z by Alcon)†

†Interchanged to latanoprost with same dosage (usually 1 drop daily)

Unoprostone Ophthalmic Solution
(Rescula® by Novartis)‡

‡Off the market

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POLICIES AND PROCEDURES

Cytotoxic drug dose-rounding allowed

The Shands at UF P&T Committee passed a policy that permits automatic dose-rounding for cytotoxic chemotherapy up to 5% unless the patient is part of an investigational protocol. Dose-rounding for patients on an investigational protocol will occur based on protocol specifications. This policy applies only in the inpatient setting.

Benchmark data showed that many institutions use 5 or 10% rounding of chemotherapy doses. There are also articles published supporting this practice. Inaccuracies of estimating patients' body surface areas make rounding to within 5% of the calculated dose unlikely to have any clinical effect on either response or toxicity.

If higher dose-rounding is approved, it will be on a case-by-case basis. For example, doses of biologicals like rituximab are routinely rounded by 10%.

The rounded chemotherapy dose will be communicated to the prescriber and nursing staff via a Chemotherapy Clarification Order Form, which will list the dose change as a "P&T-Approved Change — Dose Rounded to +/- 5%."

References available upon request to the editor.

NEWS

The old pharmacy intranet site is dead... Long live the new pharmacy portal

The old pharmacy intranet site is no longer being maintained on the MedIC server and this server is no longer available. The new (and up-to-date) pharmacy website is on the ShandsConnect portal (https://my.portal.shands.ufl.edu/portal/page/portal/DEPT_CONTENT/Pharmacy/UF). Please update this bookmark in your browsers. Access to this secure site requires a username and password.

The new Shands at UF Pharmacy portal looks a lot like the old intranet site with sections for *News* and *Contact Information* on the right and *Drug Information*, *The Formulary*, *The P&T Committee*, *The Outpatient Pharmacy*, and *Pharmacy Department Tools* on the left navigation bar. Each topic on the left navigation bar has several links underneath that will guide you to important content.

The *Drugs Listed in the Formulary* link now interfaces with the Pharmacy Department's computer system. This application lists drugs in the *Formulary* by generic name, brand name, strength, dosage form, route of administration, therapeutic class, and formulary status. Restricted drugs are listed as "R" in the formulary status field. The *Formulary* can be searched by any of its fields. When searching to see if a drug is listed in the *Formulary*, the generic name should be used. Brand names should be used for combination products. You can truncate any search, which will help if you are not sure of a word's spelling. You can truncate any part of a word for your search. For example, placing "**pril**" in the search field will find all angiotensin-converting enzyme inhibitors listed in the *Formulary* (eg, capto**pril**, enala**pril**, lisino**pril**, and rami**pril**). We are working diligently to update the therapeutic category listings to improve the functionality of the electronic *Formulary*. The direct link to the Shands at UF *Formulary* is http://shands-formulary.shands.ufl.edu.

Current and back issues of the *Drugs & Therapy Bulletin* also can be found in the Drug Information section of the left navigation bar, along with other helpful links. The "Search" function on the upper right-hand corner of the portal can be used to find old topics in the *Bulletin*, like when drugs were added to or deleted from the *Formulary*.

Please send comments or questions about this site to hatton@ufl.edu.

◆ INSIDE THIS ISSUE

Formulary update, *from page 1*

◆ THERAPEUTIC INTERCHANGES

Latanoprost Ophthalmic Solution (Xalatan®)
for Bimatoprost (Lumigan®)†

Latanoprost Ophthalmic Solution (Xalatan®)
for Travoprost (Travatan®)†

†Interchanged to latanoprost with same dosage (usually 1 drop daily)

◆ CRITERIA FOR USE CHANGES

Haloperidol Intravenous (Generic)§

§Restricted to use in an ICU or Unit 54. Baseline ECG required.

Cefixime is a third-generation cephalosporin that was added in the *Formulary* for the single-dose oral treatment of gonorrhea in August 2007. At that time, only cefixime suspension was available.

When cefixime was removed from the market in 2002, it left a gap in the oral management of gonorrhea. Injectable ceftriaxone remained a viable alternative, if patients could receive an injection. Ironically, injectable ceftriaxone is less expensive than oral cefixime. Generic ceftriaxone injection is available from multiple vendors, whereas oral cefixime is available from only 1 company (ie, Lupin Pharma).

Cefixime is now available as a 400-mg tablet, which costs $7.35. Cefixime suspension 200 mg/5 mL is stable for only 14 days. We have been creating unit-dose syringes. Most of these are discarded and not used (ie, wasted). Each 50-mL bottle costs $137.20. Since cefixime suspension was added in the *Formulary,* it has been used in 38 patients (almost all in the Emergency Department & no children).

Fluoroquinolones used to be an oral option for the treatment of gonorrhea. However, because of high-level fluoroquinolone resistance among *Neisseria gonorrhoeae* isolates, fluoroquinolones are no longer recommended by the Centers for Disease Control (CDC).

Cefixime tablets replaced cefixime suspension in the *Formulary.* There is no obvious stability reason why cefixime tablets could not be crushed and administered; however, taste and smell could be an issue.

Hexachlorophene is a topical agent that has been used as a surgical scrub or skin cleanser. Recently, Materials Management stopped providing hexachlorophene to the OR. Since hexachlorophene is a prescription drug, continued availability required review.

A literature review questioned hexachlorophene's use as a surgical scrub or surgical skin prep. Both efficacy and safety are concerns. The use of hexachlorophene has declined remarkably in recent years due to the adverse effects associated with its percutaneous absorption, its narrow spectrum of antimicrobial activity, and the development of more-effective agents. Hexachlorophene is currently classified by the FDA as not generally recognized as safe and effective for use as an antiseptic handwash. Current guidelines recommend that antiseptic agents used for surgical scrubs produce substantial reduction in microorganisms on intact skin, have broad-spectrum activity, contain a non-irritating antimicrobial preparation, and be fast-acting and persistent. Hexachlorophene does not meet these criteria.

Hexachlorophene is bacteriostatic and has activity against *Staphylococcus aureus* with weak activity against gram-negative bacteria, fungi, and mycobacteria. Hexachlorophene has a very narrow spectrum of activity compared to other antiseptic agents. For example, iodophors or iodine compounds have bactericidal activity against gram-positive, gram-negative, mycobacteria, viruses, fungi, and certain spore-forming bacteria (Clostridia and Bacillus spp.).

A study comparing the persistence of antimicrobial activity of detergent-based surgical scrubs containing chlorhexidine gluconate, hexachlorophene, triclosan, and iodophors found the greatest persistent activity for surgical scrubs containing 2% or 4% chlorhexidine gluconate. Comparison studies of chlorhexidine, iodophors, and hexachlorophene found chlorhexidine to be the most effective agent.

Infection Control did not give any justification for hexachlorophene use except when there are documented idiosyncratic reactions among patients and healthcare personnel to other available agents. Hexachlorophene has been used as a lubricant when harvesting skin for grafting of burn patients. Alternative lubricants include sterile mineral oil, Surgilube®, and Shur-Clens®. Unfortunately, a suitable alternative to hexachlorophene for inner ear surgeries in patients with iodine allergies could not be located. Chlorhexidine is ototoxic and cannot be used. Therefore, hexachlorophene was added in the *Formulary* for use when other more effective alternatives cannot be used. It should not be used in burns where it is contraindicated. It will be limited to availability in the OR.

Ipratropium + albuterol nebulization solution for inhalation was added in the *Formulary* as an alternative to using the individual ingredients. A combination product of albuterol 3 mg/3 mL plus ipratropium 0.5 mg/3 mL is available from various generic manufacturers. Shands at UF has a policy that allows the automatic interchange of individual ingredients for combination products. Sometimes combination products are added when the cost is less or when the combination product is considerably more convenient. This combination product would not add to pharmaceutical expenditures and is more convenient.

Sodium Chloride 7% nebulization solution for inhalation was added in the *Formulary* for use in patients with cystic fibrosis to facilitate mucociliary clearance and improve lung function. The use of this concentration is based on a study comparing efficacy with normal saline. There are no studies comparing sodium chloride 7% with lower hypertonic concentrations. Sodium chloride 3% nebulized solution remains in the *Formulary*.

Carbenicillin indanyl sodium is an oral extended-spectrum penicillin with labeled indications for the treatment of acute and chronic infections of the upper and lower urinary tract and in asymptomatic bacteriuria due to susceptible strains of certain gram-negative organisms, including Pseudomonas. It also has a labeled indication for the treatment of prostatitis.

Geocillin® will no longer be manufactured due to decreased market demand. Currently, there are no other manufacturers of this product. There are other antimicrobials (eg, oral fluoroquinolones) in the *Formulary* that are alternatives to oral carbenicillin. Carbenicillin was deleted from the *Formulary* and designated nonformulary and not available. Injectable carbenicillin was removed from the market several years ago and is also unavailable.

Bimatoprost, **travoprost**, and **unoprostone** are nonformulary topical ophthalmic prostaglandin analogues used for the treatment of glaucoma that were designated nonformulary and not available. Orders for bimatoprost and travoprost will be automatically interchanged to **latanoprost** using the same dosage (ie, usually 1 drop at bedtime). Unoprostone is not currently being marketed.

Nonformulary drugs used in the management of glaucoma receive priority review to determine their appropriate formulary status. In addition, bimatoprost and travoprost are among the top nonformulary drugs used based on the number of patients receiving these medications. Many patients use their own "home"

(continued on next page)

Formulary update, *from page 2*
medications when they are admitted to the hospital. Hospital policy allows patients to use their own ophthalmic preparations—provided an order for the medication is written that specifically states that the patient may use their own supply.

There are numerous head-to-head trials comparing the topical ophthalmic prostaglandins for glaucoma. These studies do not show superiority for 1 agent over the others. A meta-analysis using data through August 2005 concluded that there was no therapeutic advantage for any specific agent for the treatment of glaucoma. This conclusion was based on data from 12 studies including 3048 patients.

Ocular hyperemia is the most common adverse effect for this class of agents. Other common adverse effects include ocular discomfort, pruritus, visual acuity decrease, foreign body sensation, and ocular pain. The most unique adverse effects are iris pigmentation (ie, increased brown pigmentation), pigmentation around the eye (especially the eyelid), and increased pigmentation and growth of eyelashes. The long-term effects of these adverse reactions are unknown. No agent consistently has a lower incidence of adverse effects; however, the meta-analysis showed latanoprost has less hyperemia.

Travoprost has a more-restrictive labeled indication (second-line vs first-line) because of "safety concerns" (ie, safety data for first-line use has not been submitted to the FDA). Bimatoprost does not appear to offer any consistent therapeutic or safety advantage over latanoprost, and it is more expensive and less commonly used.

These agents are similar in cost. Having only 1 product decreases costs associated with storage and distribution. It also streamlines the process when nonformulary products are requested.

Intravenous haloperidol is an off-labeled use of an antipsychotic agent that has been used to manage agitated patients in the critical care setting. In September 2007, an FDA Safety Advisory was issued regarding the risk of QT prolongation and Torsades de Pointes (TdP) in patients treated with haloperidol, especially when given intravenously (IV) and at high doses. Although injectable haloperidol is approved by the FDA only for intramuscular (IM) injection, there is evidence in the medical literature that IV administration of haloperidol is a relatively common off-label clinical practice. Due to a number of case reports of sudden death, TdP and QT prolongation in patients treated with haloperidol (especially when the drug is given IV or at doses higher than recommended), the manufacturers of haloperidol have updated the labeling for haloperidol with new information in the WARNINGS section of the label.

Although cases of sudden death, TdP, and QT prolongation have been reported even in the absence of predisposing factors, particular caution is advised in treating patients using any formulation of haloperidol who have other QT-prolonging conditions, including electrolyte imbalance (particularly hypokalemia and hypomagnesemia); have underlying cardiac abnormalities, hypothyroidism, or familial long QT syndrome; or, are taking drugs known to prolong the QT interval. Because of this risk of TdP and QT prolongation, ECG monitoring is recommended if haloperidol is given IV.

Based on recommendations from the medical, nursing, and pharmacy staffs, IV haloperidol use will be limited to ICUs and Unit 54 (ie, where baseline ECGs and daily telemetry can monitor this off-label administration of IV haloperidol). Nursing will monitor the QT interval and/or QTc every shift. If the QT or QTc interval equals or exceeds 490 msec, a 12-lead ECG will be obtained to verify the QT measurement. If the QTc via 12-lead ECG exceeds 490 msec, the prescriber will be notified. Potassium and magnesium levels will be monitored.

PRESCRIBING

Potassium replacement: Is there a right way to replace K+?

Hypokalemia is a common electrolyte abnormality in hospitalized patients.[1] If left uncorrected, low serum potassium concentrations can lead to potentially severe complications, such as cardiac arrhythmias or disturbances in muscle function.[2] The incidence and risks associated with hypokalemia cause many patients to receive a potassium replacement product while in the hospital. Several factors determine the optimal dosage formulation, route of administration, and monitoring strategy employed when potassium repletion is needed.[3]

In general, every 1 mEq/L decrease in serum potassium below 3.5 mEq/L correlates to a total body deficit of 100 to 400 mEq. Therefore, every 10 to 40 mEq of supplemental potassium provides an approximate 0.1 mEq/L increase in the serum concentration. Variation in response warrants close monitoring and individualization of doses.

Most instances of hypokalemia in the hospital can be classified as mild (ie, serum potassium concentrations between 3.0 and 3.4 mEq/L).[1] These patients should be managed with an oral potassium product. Intravenous (IV) potassium should be reserved for patients with documented depletion of body stores, those who are displaying symptoms of hypokalemia, or in those patients unable to take medications enterally.[2]

Patients are often prescribed IV potassium products unnecessarily.[2] Over a 3-week period during an evaluation of potassium prescribing habits, 73% of replacement potassium orders were for an IV product, with 85% of these for patients with normokalemia or mild to moderate hypokalemia (ie, serum potassium concentration between 2.6 and 5.0 mEq/L). Further, 69% of these patients were eligible for oral therapy.[2]

The perception may be that IV therapy corrects the electrolyte imbalance more rapidly and effectively than an enteral alternative. However, several points warrant attention regarding the routine use of the IV potassium products. Non-urgent orders for IV potassium will often be transmitted to the IV Center for preparation. It will generally require 60 to 90 minutes from the time the order is written before a dose arrives on the unit to be administered. IV doses of potassium are typically infused slowly and must be diluted according to strict institutional policy secondary to safety concerns surrounding the use of concentrated solutions. Conversely, oral replacement doses can often be processed, verified, and made available for the nurse to retrieve from the automated dispensing cabinet within minutes.

Nonetheless, oral potassium replacements are not benign, and recently attention has been focused on potential drug interactions with the solid oral

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Prescribing, from page 3

formulations of potassium chloride. The combination of solid oral potassium dosage forms with medications that possess significant anticholinergic activity is contraindicated.[4] Anticholinergic agents slow the passage of potassium tablets through the gastrointestinal tract, enhancing its exposure and contact with the esophageal and gastric mucosa.[5] The interaction can potentially result in severe upper alimentary canal damage secondary to the inherent irritating and corrosive properties of the potassium salt.[5] It is also contraindicated to administer a solid oral potassium product to patients with pathological or structural conditions delaying gastrointestinal transit time, such as diabetic gastropathy or left atrial enlargement.[4,5]

At Shands at UF, combinations of K-Dur® (potassium chloride extended-release tablets) with medications such as glycopyrrolate, tolterodine, diphenoxylate-atropine (Lomotil®), and oxybutynin commonly cause alerts for these contraindicated combinations. Strategies must be devised to avoid this problem.

The self-evident strategy to prevent a potential severe drug interaction from manifesting is to discontinue 1 of the drugs. This can most easily be accomplished by avoiding K-Dur® in patients who are on concomitant medications that are considered anticholinergic in nature. An alternative to K-Dur® is the oral liquid potassium chloride product listed in the *Formulary*. Liquid preparations facilitate passage through the esophagus and stomach, minimizing the amount of time the potassium salt has to induce mucosal damage.[5] Of note, the liquid formulation of potassium chloride is extremely unpalatable, and should always be diluted with 60 to 120 mL of water or juice before being administered. Other available liquid preparations include potassium acetate and potassium phosphate. However, in cases where hypokalemia is precipitated by diuretic use, vomiting, and nasogastric drainage, potassium chloride is the preferred salt.[3] Another option is to create a slurry using the K-Dur® tablet, yielding a suspension that can be administered concurrently with anticholinergic medications. This is done by placing the tablet in 4 ounces of water, and allowing 2 to 3 minutes for dissolution to occur. After the tablet has dissolved, the particles are to be uniformly dispersed and the complete contents consumed by the patient. An additional 4 ounces of water should be added to the empty container, with the dispersion and consumption process repeated at least once to ensure the entire dose is delivered.

The situation also presents an opportunity to perform a medication profile review, where it may be determined that it is appropriate to discontinue the anticholinergic medication triggering the interaction alert. However, some of these medications are used for chronic conditions; and, thus, discontinuation is not feasible.

Potassium supplementation is very common in hospitalized patients. IV infusions are often unnecessary. For asymptomatic mild to moderate hypokalemia, an oral dosage form is preferred. When using solid oral potassium products, avoid drug interactions with agents displaying anticholinergic activity. In these instances, liquid potassium chloride should be used as the enteral agent of choice, and consideration should be given to discontinuing the anticholinergic agent if an extended-release formulation of potassium is absolutely necessary.

by Michael Mathisen, PharmD

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