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Pharmacy & Therapeutics Update: Drug Information for Health Care Professionals

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Update

Drug Information for Health Care Professionals

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Medication Error Prevention Strategies in the Pediatric Population

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Pediatric patients often require medication therapy during their childhood and require special consideration because they are at an increased risk for medication-related errors.[1-8] Young children have less developed communication skills compared with adults, which impedes feedback to health care professionals about potential adverse effects or mistakes in medication administration.[5] In addition, children are less likely to ask health care professionals about their care.[4]

Pediatric patients may be up to 3 times more likely than adult patients to experience a medication error.[2] Pediatric patients are most likely to experience medication errors due to health care professionals being unfamiliar with pediatric dosage forms and weight-based dosing.[2,4]

The medication use cycle includes prescribing, transcription, preparation, dispensing, administration, and monitoring.[2] The most commonly reported errors are the administration of an incorrect dose or incorrect frequency, the administration of an inappropriate medication for the condition being treated, the prescribing of the wrong route of administration for a medication, and failure to perform follow-up monitoring for adverse reactions and drug interactions.[2] The lack of information regarding pediatric doses and dosage forms may also increase the risk of errors.[2]

Some strategies to help reduce medication errors include standardizing order forms with weight-based dosing and allergy information as required components of the order. Standardizing weight measurements (ie, only expressing body weight in kilograms) across the organization decreases confusion regarding weight-based dosing.[2] MUSC order forms may be accessed at www.musc.edu/cce/ORDFRMS/.

In addition, by encouraging employees to report errors, more detailed information can be obtained regarding pediatric medication errors, and better policies can be

developed and implemented.[2,4,7] Medication errors occurring at MUSC should be reported on the Patient Safety Net (PSN) Website which can be accessed using the UHC PSN icon located on every LYNX workstation.

Prescribers should be encouraged to write legibly using unambiguous language.[2,4] Orders for pediatric patients should be written based on weight, and prescribers should ensure that the prescribed dose does not exceed the usual adult dosage.[2] In addition, prescribers should ensure that they are using the patient's current weight when writing orders.[2] Because medication errors are most likely to occur when orders are written for intravenous fluids, orders should be written to include dose and volume, as well as quantifying additives per liter, and also including the rate at which the solution is to be administered.[2] All instructions should be written out to eliminate confusion and vague instructions. Institutions should establish prohibited abbreviations, and all orders that are written using these abbreviations should be clarified.[2] Prescribers should avoid the use of terminal and leading zeroes.[2] For example, orders for 5 milligrams of a medication should be written as 5 milligrams as opposed to 5.0 milligrams.[2] The use of terminal zeros may lead to a pharmacist misinterpreting the order as 50 milligrams, resulting in a 10-fold overdose.[2] The names of medications should be spelled out and not abbreviated, and generic names should be used in place of brand names.[2] Physicians should also be required to print their name along with a signature and contact number.[2] The MUSC policy regarding medication orders may be accessed at www.musc.edu/medcenter/policy/Med/C78.pdf, and the policy regarding prohibited abbreviations may be accessed at www.musc.edu/medcenter/policy/Med/C21.pdf.

Pharmacists working in children's hospitals should ensure that all medication orders are written according to organizational guidelines.[2,4] Pharmacists can work with prescribers to help ensure that all medications ordered are in an easy-to-administer dosage form and that there are no cross-sensitivities with allergies or interactions with pre-existing medications.[2] In addition, all orders requiring calculations should be rechecked for accuracy, and all confusing orders should be clarified.[2] Studies have shown that errors are less likely to occur when a clinical pharmacist is present on rounds or is involved in dosing medications.[2,7] Pharmacists can also be involved with medication histories and discharge counseling to help ensure that parents are familiar with pediatric medication administration.[2,4,8]

Nurses are usually the last step in the medication use cycle before the medication reaches the patient. The nursing staff should be encouraged to recheck all previous calculations and verify all medication orders before administering medications to the patient.[2] In addition, nurses should frequently consult with parents to ensure that all questions are answered regarding medication therapy.[2,4]

Technology can play a significant role in decreasing medication errors. Some examples include computerized prescriber order entry, computerized medication administration records, automated pharmacy systems, bar-coding, "smart" intravenous devices, and computerized discharge prescriptions and instructions.[5]

Through instituting policies and procedures, integrating technology appropriately into the organization, and continued training, medication errors in pediatric patients can be reduced.

Did You Know...

Acute phosphate nephropathy associated with the use of oral sodium phosphates (OSP) (eg, Fleet® Phospho-soda®) for bowel cleansing has been reported by the Food and Drug Administration. Individuals at increased risk of acute phosphate nephropathy include those of advanced age, those with kidney disease or decreased intravascular volume, and those using medications that affect renal perfusion or function. Use of OSP in patients with kidney disease, impaired renal function or perfusion, dehydration, or uncorrected electrolyte abnormalities should be avoided. Also, the recommended doses of OSP should not be exceeded, and the concomitant use of laxatives containing sodium phosphate should be avoided. Patients should be adequately hydrated during bowel cleansing, and baseline and post-procedural laboratory values should be evaluated in patients at risk for serious adverse events.

Prescribing Restricted Formulary Medications: How You Can Help Us Help You

The Pharmacy and Therapeutics Committee recently approved standardized scripting for physicians to use when writing orders for restricted formulary medications. By using standardized wording, physicians will improve the efficiency with which a pharmacist can process an order for a restricted medication. Scripting of orders for restricted formulary medications will also assist the pharmacist processing the order to determine whether the intent of the restriction is met. An additional benefit is that fewer telephone calls will be made by pharmacists to physicians for order clarification. The following examples illustrate the use of scripting orders for restricted formulary medications. Approved scripting appears in boldface.

An internal medicine physician (Dr. Barton) wants to prescribe linezolid for a patient on 8 West. The formulary restriction on linezolid specifies that when it is used outside of an intensive care unit, a consult must be obtained from an attending or fellow on the infectious diseases service. The order that Dr. Barton writes is as follows: linezolid 600 mg, IV, Q12H, **verbal approval obtained from Dr. Cantey on ID Consult Service concerning formulary restriction**.

A pediatrician (Dr. Noyes) wants to prescribe meropenem for a pediatric patient who weighs 22 kilograms. The formulary restriction on meropenem specifies that this agent may be used in patients with cystic fibrosis. The order that Dr. Noyes writes is as follows: meropenem 440 mg, IV, Q8H (60 mg/kg/day), **patient has cystic fibrosis concerning formulary restriction.**

Physicians who prescribe restricted formulary medications are asked to use the approved scripting. The Medical Center *Formulary System Policy C-82* has been revised to reflect this practice. Formulary restrictions are noted in the electronic formulary, and an alphabetic listing is available at www.musc.edu/pharmacyservices/DI/restricts.pdf.

Dexmedetomidine

Dexmedetomidine (Precedex®), is a relatively selective alpha$_2$ agonist with sedative properties. This medication is significantly more costly than similar alternatives (eg, propofol, midazolam).

An interdisciplinary group was convened to develop guidelines for appropriate use of dexmedetomidine. The group was led by Holly MacFall, PharmD, and consisted of Alice Boylan, MD; Julio Chalela, MD; Jack Crumbley, MD; and Susan Harvey, MD. Frank Mielck, MD; Joel Cochran, MD; Fred Tecklenburg, MD; and Sally Webb, MD, were also consulted during the development of the guidelines. The guidelines are printed on page 4 and are posted online at www.musc.edu/pharmacyservices/medusepol/DexmedetomidineGL.pdf.

Formulary Update

The Pharmacy and Therapeutics Committee recently approved the following actions that became effective May 15, 2006:

Additions:
Acamprosate (Campral®)
333-mg enteric-coated tablets

Additions with Restriction:
Suboxone®
2/0.5- and 8/2-mg sublingual tablets

Palifermin (Kepivance™)
6.25-mg vials

Deletions:
Urokinase (Abbokinase®)
9000- and 250,000-IU injections

Streptokinase (Streptase®)
250,000-, 750,000-, and 1,500,000-IU injections

Lipisorb® nutritional supplement
8-oz cans

Vasocon-A®
0.5-oz ophthalmic drops

Accuzyme® Spray
33-mL bottles

Line Extentions:
Risperidone (Risperdal® M-Tab®)
3- and 4-mg orally disintegrating tablets

Accuzyme® Ointment
6- and 30-g tubes

Temporary Product Replacement:
Perflutren lipid microspheres (Definity®)
2-mL vial

Change in Restriction:
Dexmedetomidine (Precedex®)
2-mL vials [100 micrograms/mL]

MUSC Dexmedetomidine (Precedex®) Guidelines for Use

Restrictions

Prescribing is restricted to physicians with deep sedation privileges or attending-level physicians and fellows practicing in a critical care setting or anesthesiology.

Dosing Guidelines and Indications

Dexmedetomidine may be used for the following indications in adult patients, for **no greater than 24 hours**.[1]

Generally initiate a loading dose of 1 microgram/kg over 10 to 30 minutes (consider longer load [ie, 30 minutes] for patients ≥ 65 years of age).

A loading dose should be followed by a maintenance infusion of 0.2 to 0.7 micrograms/kg/hr.

Dose reductions should be considered in patients with renal or hepatic impairment.

‡Sedation of initially intubated and/or mechanically ventilated adult patients in the ED, OR, or ICU with an absolute or relative contraindication to propofol, benzodiazepines, and/or opioids (eg, hypersensitivity, hypertriglyceridemia) [1]

‡Awake craniotomy in adult patients [2-8]

‡Extubation of ICU and post-operative adult inpatients in an ICU or PACU when unable to wean using propofol, benzodiazepines, or opioids or when they are contraindicated [9-19]

£Sedation prior to ECT in adult patients with a history of postictal agitation [20]

‡Intubated and nonintubated adult neurology patients, in an ICU, requiring sedation and frequent neuroassessment when other short-acting titratable sedatives are contraindicated or ineffective [8, 13, 21-25]

‡Awake fiberoptic intubation [26-29] **or £bronchoscopy in adult patients with difficult airways whose comorbidities may increase risk for developing hypoxemia and/or hypercapnia during intubation and/or patients in which hypoxemia and/or hypercapnia could significantly increase morbidity or mortality (eg, head trauma, history of sleep apnea, morbid obesity)**

‡Bariatric surgery in adult patients (immediate postoperative period only) [30-37]

‡Sedation or agitation in pediatric patients in an ED, OR, PACU, ICU, or radiology with an absolute or relative contraindication to propofol, benzodiazepines, chloral hydrate, and/or ketamine (eg, hypersensitivity, sedation failure, respiratory depression, paradoxic agitation) provided appropriate monitoring is in place [38-40]

‡Literature to support dexmedetomidine use
£Lack of literature to support dexmedetomidine use

Monitoring Parameters

Level of sedation using SAS
Blood pressure every 5 minutes for first 30 minutes, then every 15 minutes
Heart rate
Continuous oximetry
Telemetry
Renal function

References available upon request