

the Pediatric Emergency Messenger



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Advancing the Frontiers of Pediatric Emergency Care in Tennessee

Plan now to join your hosts from T.C. Thompson Children's Hospital and colleagues from across the state on September 23 and 24, 2005 for the 4th annual "Advancing the Frontiers of Pediatric Emergency Care in Tennessee" conference. This year's conference will be held at the historic Read House Sheraton (never mind the resident ghost) in scenic downtown Chattanooga. The conference will be presented by the TNAAP Committee on Pediatric Emergency Medicine, the Tennessee Emergency Medical Services for Children Foundation, and the Comprehensive Regional Pediatric Centers in Tennessee. The conference agenda is designed to appeal to a broad range of health care providers—physicians, nurses, pre-hospital providers and others interested in enhancing and updating their pediatric acute care knowledge. Pediatric pain, update on PALS, methamphetamine abuse in Tennessee, how to prepare your pediatric office for an emergency. These are only a few of the important topics relevant to your practice. The focus of the conference is to provide practical clinical information regarding urgent and emergent pediatric issues in an atmosphere that encourages participant interaction.

You are also invited to join us Friday evening of the conference for the "BIDZ For KIDZ Auction," an evening of art, music, food and fun at the Hunter Museum of American Art. The Museum recently reopened following a \$19 million renovation as a part of Chattanooga's innovative

21st Century Waterfront Plan. This fundraising event will offer hundreds of items for bid and will benefit the newly created Tennessee Emergency Medical Services for Children Foundation and the T.C. Thompson Children's Hospital Education Fund.

For more information, please contact Anne Cowan at (423) 778-6402 or anne.cowan@erlanger.org. Conference registration and information will also be available on-line at www.TCTCH-EMSC.org. Early registration discount ends on August 22, 2005.



Do you have any pediatric emergency issues you would like to see addressed in this newsletter?

We welcome your comments and suggestions. Please email the editor at: rlembersky@pol.net.

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Phenergan Warning for Children Less Than Two Years of Age

On January 4th, 2005 Wyeth Pharmaceutical and the FDA issued a black box warning on the use of phenergan. Phenergan is now contraindicated for use in pediatric patients less than two years of age, and caution should be used when administering phenergan to pediatric patients 2 years of age and older.

These new prescribing recommendations are made because of the potential for fatal respiratory depression in patients less than 2 years of age. These episodes of respiratory depression have occurred in a wide range of weight-based doses of phenergan. It is now recommended that the lowest effective dose be used in pediatric patients over 2 years of age and avoidance of concomitant use with other drugs that may cause respiratory depression.

Further information can be obtained at:

<http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/psn/transcript.cfm?show=39#8>

<http://www.fda.gov/MED-WATCH/SAFETY/2005/jan05.htm>

Rita Westbrook, MD
Memphis

Prescribing Errors in Pediatrics, “Doctor did you mean to . . . ?”

Martin I. Herman,
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“To Err is Human”, the report from the Institute of Medicine, has triggered a nation wide look at improving the safety of medical practices. Sadly nearly 100,000 people a year die as a result of medical errors and 75% of these are drug related.¹ The Harvard Medical Practice Study reported that in 1984, 3.7% of hospitalized patients experienced some type of Adverse Drug Event (ADE). When it comes to pediatric patients they are at even greater risk as medication errors have been found to occur in over 10% of medication orders written for children.²

Pediatricians know that from birth through most of childhood a child’s ability to absorb, distribute, metabolize, or excrete medications may change, making prescribing a bit more challenging. A study of medication errors among pediatric inpatients found 616 (5.7%) medication errors, 115 (1.1%) potential ADEs and 26 actual ADEs, among 10,778 total medication orders.³ If you look at errors occurring in emergency departments, you will find the rates to be even higher.⁴ On a more positive note, possibly 30% or more medication errors could be prevented and that fact alone should motivate us to examine the process of drug therapy to identify opportunities to prevent errors from reaching the patient.

At the manufacturing level, medications need to be made with children in mind. Solutions and suspensions that are stable and palatable are badly needed. This would negate the need for pharmacists to extemporaneously compound medications. Obviously there are risks for errors when compounding. These range from calculation errors, dilutional errors, errors from mixing incompatibilities, possibly adverse effects on the

availability of the
ve ingredients, to
a few. Even when
e are professionally
manufactured pedi-
atric products,

someone has to be able to determine how much is to be given. No matter who does the calculation, an error could occur.

That most pediatric drug doses have to be calculated based on the patient’s weight is well known. An accurate weight is of paramount importance yet when studied, weights were missing, inaccurate or reported using pounds in a busy pediatric emergency department.⁵ If a calculation used to determine the drug dose depends on the weight being in kilograms, as most do, then reporting the weight in pounds could result in a 2 fold error in the amount of drug ordered. Even when this type of error is detected, converting from pounds to kilograms provides another chance for a math error to occur. It has been shown that interns and residents, especially early in their training, are not well prepared to do the math involved in prescribing.⁶ There is clearly a need to improve the education and training of providers in the skills needed to accurately order and prescribe medication.

Prescribing errors are also more likely to occur when the provider is sleep deprived, working weekends or faced with seriously ill patients.^{2,3,4} Fortunately, computerized order entry (CPOE) systems are being developed that could help prevent prescribing errors.⁷ Of course nothing is perfect and CPOE systems also have to be monitored and checked to prevent errors from being perpetuated.⁸ An alternative to having to perform calculations to determine drug dosages is the new Broselow-Luten system being test marketed now.

Broselow and Luten began by assigning an approximate weight to children based on the child’s length, after developing and validating a length-weight nomogram. Then they selected a range of weights that could be averaged into one grouping without risking over dosing or under dosing the children. Each weight grouping was assigned a unique color, and on the tape they printed the recommended endotracheal tube sizes, nasogastric tube sizes, and various drugs

and dosages that should have been appropriate to a child of that size. Hence the Broselow Tape was developed and is now a staple in emergency departments and among EMS providers nationwide. Taking a lesson from the early success with this approach, Broselow and Luten have developed a book of most of the drugs commonly prescribed for children, including drugs given as drips. In it the drug doses appear within colored bands, similar to the bands on the Broselow tape. Each color section has the dose of the drug already calculated, even when the medication is a suspension or solution. One assigns the color band by weighing the child first and if the child can’t be weighed on a scale, then the length based tape is used to estimate the weight and assign a color. Once a color band is assigned, simply turn to the medication desired and select the dose. Since the drips are calculated using standard premixed drips currently on the market, any calculation of drip dose, rate of infusion or mixing errors are eliminated. This system has the potential to eliminate errors of calculations for medications being ordered for children (Broselow-private communication).

Many other types of errors can lead to an adverse drug event. Drugs may have sound alike names, that could lead to an error in drug selection or dispensing, whether the order was given verbally, handwritten, by facsimile, or computer generated. Drug packaging may lead to confusion if the appearance of different medications is too similar. Use of a “brand” to identify several different products has caused confusion (Robitussin vs Robitussin PE for example). Nurses or pharmacists could misinterpret verbal orders, or handwritten orders if illegible. Unclear orders, orders that use abbreviations, orders that fail to use a leading zero as a place holder for drug dosages that are <1 can result in significant errors. Ten fold errors are common because prescribers frequently use a trailing zero, which may make the order appear 10 times larger. Other sources of a ten fold error include mis-

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placing a decimal point in a calculation, failing to see a decimal point on an order, or making a decimal error in converting metric units.⁹ The numbering of medication orders can cause confusion if the drug dose is written next to the numeral marking the order. For example an order written like this:

1.5mg diazepam po, may be misread as 15 mg, or 1.5 mg, instead of the intended order: 1. give 0.5 mg diazepam.

Obviously ignoring or not having access to the medical history, especially when allergies are reported is potential for an error. Failure to properly identify patients may also be a serious avoidable error.¹⁰ In the ED, this may be a big issue due to the lack of familiarity with the patients. On the inpatient services, errors may occur when an order is transferred incorrectly into a medication administration record.³ Other errors include administering medications in a different form or via a different route than intended, which may or may not be associated with potential harm (i.e. giving diphenylhydantoin IM instead of IV, may result in inadequate seizure control).

What can we do as providers to prevent drug errors?

1. Insist that manufacturers provide us the best drugs and drug forms to prescribe for kids.
2. Insist that a scale is used to determine a patient's weight and report that weight in kilograms only.
3. Look up drug doses, if unsure.
4. Have drug calculations checked and double checked.
5. Use a pharmacist whenever possible to check medication orders.
6. Write legibly, and /or use preprinted orders and preprinted prescription pads.
7. Be sure to review any pertinent medical records.
8. Be sure to notate any medication allergies as prominently as possible.
9. Have all verbal orders read back

for accuracy and write out the order ASAP.

10. Maintain good sleep habits, avoid working sleep deprived.
11. Institute a system for positive identification of all patients.
12. Be especially careful with patients speaking a different language.
13. Do not use abbreviations. (Is DPH diphenhydramine or diphenylhydantoin?)
14. Use leading zeros on all orders involving amounts <1.0.
15. Do not use trailing zeros.
16. Do not place the drug dose adjacent to a numeral used in a list of orders.
17. Encourage a climate free from blame for questioning and reporting errors.
18. Remember, "To Err is Human", so make use of as many fail safe systems to assure the safety of your prescribing practices.

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Intravenous Rehydration for Gastroenteritis: How Long Does it Really Take?

A literature review by Cori Peck MD with summary review by Jeanette Galicinao, MD, and Keven Cutler, MD

The article reviewed: Bender B., Ozuah P. *Pediatric Emergency Care*. Volume 20, Number 4, April 2004. Pages 215-218.

Dehydration from gastroenteritis leads to the hospitalization of over 200,000 US children per year. Over the past several years, the AAP has published many guidelines stating that oral rehydration therapy (ORT) over 4 hours is the preferred method of rehydration for mild to moderate dehydration from acute gastroenteritis (AGE). Despite these guidelines, ORT is used in <30% of eligible cases, especially in emergency departments (ED). Physicians in the ED have traditionally been much less likely to use ORT due to beliefs that IV rehydration is quicker and requires less ED time than ORT. This study was performed to test the theory that IV fluids take less than 4 hours in the ED.

Dr. Bender, et al have written a prospective case series that looks at whether children who receive IV hydration for AGE spend less than 4 hours in the ED. 549 patients were treated with IV fluids for mild to moderate dehydration from AGE. Treatment time was defined as the time from when the physician saw the patient until the physician discharged the patient. Waiting room time and nursing time prior to being seen by a physician were excluded from the study. The mean time for treatment was 5.4 hours vs. 1.2 hours for "all other patients." The longest times were noted in the morning and evening, on Tuesdays, Thursdays, and Sundays, during the winter, and in children less than 3 years old.



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Intravenous Rehydration for Gastroenteritis, continued from page 3

Although this article showed that IV fluids for mild to moderate dehydration in the ED took longer than their hypothesized 4 hours, they failed to discuss how long ORT took in their ED. They compared their 5.4 hours to "all other patients," but failed to mention what their patient population included. There are many questions left unanswered. Does the level of acuity change the amount of time spent with each patient. Does this hospital attend to level 1 trauma patients? Do they see many ICU-worthy patients? An emergency department with a high level of acuity would probably take longer than 4 hours than would another department who attended mostly to urgent-care/non-emergent type patients. The study authors also failed to discuss why their times were longer for various times of day and year. Perhaps the longer wait times during this period was due to an increased patient volume or possibly to understaffing on certain days of the week.

Also, staff expertise may have entered into play. Were these new nurses trying to put intravenous lines into children in which the placement of the IV was difficult? Perhaps the children receiving intravenous lines were more dehydrated than other children who only received ORT, as typically, it is more difficult to successfully place an IV line in a dehydrated child. None of these factors were discussed in the article.

Additionally, the study did not address the method by which the fluids were given. Did the subjects' receive a standardized bolus or as 1-2 times maintenance? These two methods alone would influence the length of time for therapy. This article was also lacking in other areas. The authors applied very few statistics to their results. They calculated mean times for treatment with standard deviations and then compared IV fluids versus "other patients' times" with a p value <0.001.

This article only published the

authors' observations. At their hospital, the administration of intravenous fluids took longer than the recommended 4 hours. Yet as mentioned previously, the many factors that can alter and affect their observation were not addressed in a competent manner.

Based on this article (which more accurately, was a summary of their reported perceptions and observations), there should not be any changes made to current rehydration policies and practices at LeBonheur Children's Medical Center. It may serve to help us become more aware of our management of dehydrated patients in the emergency department. This article does stimulate some discussion about using oral rehydration in triage before the patient is seen by a physician. Our center may be able to use this article's basic idea and apply ORT to our population in order to have a more effective emergency department.