



Perinatal Gazette



Newsletter of the Regional Perinatal Center

Maria Fareri Children's Hospital at Westchester Medical Center

Volume 5, Issue 2

March 2005

The Regional Neonatal Follow-up Program ...

is proud to welcome Dr. Jordan Kase, MD, as the new program Coordinator. The Regional Neonatal Follow-up Clinic (RNFC) is a neurodevelopment program based at the Children's Rehabilitation Center (CRC) located in White Plains, NY. Patients are also seen on a regular basis as a satellite clinics in Middletown and Putnam County, NY.

Dr. Kase completed his undergraduate and Medical School training at The George Washington University in Washington, D.C. After earning his M.D., he went on to the New York University Medical Center for internship and residency in the field of pediatrics. Upon the completion of residency in June of 2001, he continued his training as a fellow in neonatology at the New York Presbyterian Children's Hospital of New York at Columbia Medical Center. His primary research interest as a fellow centered on the long term developmental outcomes of premature babies. Dr. Kase completed his fellowship in June 2004 and in July joined the neonatal group at the Maria Fareri Children's Hospital as Assistant Professor of Pediatrics.

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Dr. Kase works as an attending physician in the Neonatal Intensive Care Unit (NICU) at the Maria Fareri Children's Hospital, however the majority of his time is spent as the Coordinator of the RNFC. Here, Dr. Kase evaluates babies from Westchester Medical Center, or any of the other 14 regionally affiliated Nurseries, as well as other children from the Hudson Valley region. These children are followed from hospital discharge up to school age. The patients attended to at the RNFC include but are not limited to former preterm babies; babies born to women that abused drugs or alcohol during pregnancy; children with congenital heart disease or another surgical problems operated on during the neonatal period; and children with asphyxia at birth. At the RNFC, the children's neurodevelopment growth is closely followed. The primary goal of the clinic is to ensure that these special children receive all of the necessary services to optimize their growth, neurological & cognitive outcome. In conjunction with the child's primary care pediatrician, any medical or behavioral problems that the child may be exhibiting are also addressed.

"As coordinator of the Regional Neonatal Follow-up Clinic, I hope to help strengthen a growing and active clinic. My goals include conducting prospective developmental evaluations on this unique group of patients, and helping to improve their lives, and that of their families."

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Sickle Cell Disease

What is sickle cell disease? What triggers an otherwise spherical red blood cell to reorganize itself in the shape of sickle? More interestingly, why would nature select to conserve such a phenomenon?

Red blood cells are unique by virtue of what they carry: Hemoglobin. The role of the red blood cell (RBC) is to essentially transport oxygen. Without hemoglobin the transport of oxygen would be an impossible task. Hemoglobin is a protein with four parts. It has two pairs of polypeptide chains with a heme group attached to each chain. It consists of two α -chains and two β -chains. The normal adult hemoglobin A₁ comprises 95 percent of hemoglobin. The remaining 5 percent of hemoglobin usually consists of hemoglobin A₂ (containing two α -chains and two δ -chains) and/or fetal hemoglobin (hemoglobin F), with two α -chains and two γ -chains. In sickle cell disease, hemoglobin S, (hemoglobin SS) is present. This "SS" signifies that the patient has inherited a copy of the sickle cell trait from both the mother and father. Sickle cell trait (hemoglobin AS) signifies that the patient is a carrier and does not suffer from the disease itself.

A single substitution of valine for glutamic acid at the sixth position in the β -polypeptide chain causes a significant change in the physical characteristics of hemoglobin. Evolutionarily speaking, the mutation in the hemoglobin gene is thought to originate from areas of this world where malaria was an everyday occurrence. Those who had the sickle trait tolerated and survived malaria.

At low oxygen tensions, such as high altitudes, RBCs containing hemoglobin S shift from the spherical to a sickle shape. Sickling can also be triggered by hypoxia, acidosis, or dehydration. The biological consequences to this shape alteration are significant. The sickled shape of the RBC is hardly optimal for the transport of oxygen, or for navigating the varying sizes for blood vessels of the circulatory system. The sickled shape impedes the movement and eventually leads to a slow, sluggish flow we refer to as sludging. Sludging can occur in small vessels causing small blood clots in the affected organs. Painful vascular occlusion episodes can occur involving multiple organs.

CONTINUED NEXT COLUMN:

The most common sites for these episodes are the extremities, joints, lung, and abdomen. The life span of the RBC is also at stake. Sickle cells have a life span 5 to 10 days, compared with 120 days for a normal RBC. Interestingly, infants with sickle cell anemia show no signs of the disease until the concentration of hemoglobin F falls to adult levels due to special oxygen carrying properties of fetal hemoglobin.

Approximately 1 of 12 African-American adults in the United States is a carrier for hemoglobin S. If a patient is a carrier, the partner should be tested, and if both are carriers, prenatal diagnosis should be offered. Pregnancies complicated by sickle cell disease are associated with poor perinatal outcomes. The rate of spontaneous abortion may be as high as 25 percent. It has been hypothesized that sickling in the uterine vessels may lead to compromised fetal oxygenation. This can restrict fetal growth. Stillbirth is also a known complication. Antepartum fetal testing, along with sonography to assess fetal growth can be used to manage sickle cell patients. Thus, women with the sickle cell trait or sickle cell disease should be followed by a high-risk center. Westchester Medical Center is well experienced in caring for women with sickle cell disease and trait.

Guidelines in caring for pregnant women with sickle cell disease/trait can be found at the website of The American College of Obstetricians and Gynecologists: www.ACOG.org

Geetha P. Rajendran, M.D
OB Attending Physician, CWPW, WMC

Happenings:

-Advancing Quality Health Care for a Culturally Diverse Female Population-

Satellite Broadcast: University at Albany School of Public Health

Presented by: American College District II/NY of Obstetricians & Gynecologists

-Thursday, April 28, 2005 - 12:00 noon – 1:00 p.m.

Speaker: Lisa Eng, DO, FACOG

-For Information: email – coned@albany.edu or visit www.albany.edu/sph/coned

-Annual Perinatal Day Symposium -

8AM-4PM at Maria Fareri Children's Hospital, WMC

-\$50-Nurses, RT's, NNP's, PA's, Fellows, etc. \$100 - MD's

*Fee includes coffee & luncheon

For information: Contact Dr. Lance Parton @ 914-493-8558

Medication Errors in the NICU

While in many industries in which safety is paramount, notably aviation, identification of errors and a systems approach to preventing them has become a norm. In medicine this issue has remained subterranean, with little acknowledgement and, until recently, has not attracted much investigation. Medical errors came under the public spotlight when, in 2000, the Institute of Medicine published a report (*To Err Is Human*) estimating that medical errors contribute to or cause between 44,000 and 98,000 deaths each year in the US. Although the accuracy of these figures has generated some controversy, medical errors are undeniably a major problem in medicine. Various studies have confirmed that adverse medication errors are more common than usually thought. Although the majority of medication errors do not result in patient harm, errors that result in adverse drug events (ADE) are associated with increased length of hospital stay, extra costs, and mortality (JAMA 1997; 277:301-307). The potential extent of the issue is also often underappreciated. In a 40-bed NICU, 60,000-80,000 prescriptions may be written/year. Thus even an error rate of 0.1%, seemingly “trivial”, would result in 60-80 prescription errors/year. Even if only 5% of those medication errors result in an ADE, the end result is 3-4 ADEs/year. While medication errors and ADE have been the subject of a number of studies in adults, relatively little attention has been paid to this issue in pediatrics and even less in neonatology. In a recent prospective study in 2 academic pediatric hospitals, errors were found to occur at a rate of 5.7 errors per 100 orders. Most of the errors occurred at the ordering stage (79%) and many of these involved incorrect dosing (34%). These rates were similar to those found in previous studies in adults. Of concern, however, was the finding that errors with the potential to cause harm were 3 times more likely to occur in pediatric inpatients compared with adults and that patients in the NICU were particularly susceptible (JAMA 2001; 285:2114-2120 and J Gen Intern Med 1995; 10:199-205). Neonates pose special challenges in the drug ordering and delivery process. Drug dosages must be calculated individually. Weights change over time, requiring dosing recalculations. Doses must also be modified on the basis of according to postnatal age.

Thus virtually all prescriptions require patient-specific calculations. Dispensing of medication is further complicated by the fact that stock solutions of medicines are often available only at adult concentrations and must be diluted before use. All these factors increase the opportunity for errors and, in particular, 10-fold errors (so called ‘decimal point errors’). It is also possible that critically ill children may be more prone to ADE than adults because they

have less physiologic reserve with which to buffer overdose errors. The potential developmental effect of over dosage is also a concern unique to pediatrics.

Several studies in adults have shown that medication errors and ADEs are often preventable. Two of the most effective interventions to date in adults have been computerized physician order entry (CPOE) and pharmacist participation in physician rounds in the (adult) ICU. A recent study addressed the potential of various strategies to effectively prevent these errors in pediatric inpatients. Of various strategies examined, 3 were found to have the greatest promise in reducing errors. These were: 1) computerized physician order entry with clinical decision support systems, 2) ward-based clinical pharmacists, and 3) improved communication between physicians, nurses, and pharmacist (e.g. nurse involvement in rounds). Together, these 3 interventions might have prevented 96.7% of potentially harmful errors. Other interventions had a greater impact on non-harmful errors. It is important to note that CPOE is not as effective as CPOE with clinical decision support systems (CDSS) in preventing ADE. The latter includes checks of age- and weight-appropriate dose, route and frequency etc. In a study in a pediatric ICU, a ‘plain vanilla’ CPOE resulted in a near-elimination of medication prescription errors. However, it reduced potential ADEs by only 40.9%. Specifically, the incidence of inappropriate dosage or dosing intervals was not significantly reduced. (*Pediatrics* 2004; 113:59-63). Unfortunately, pediatrics is only a small portion of the overall CPOE market and limited rewards may be a disincentive for vendors to develop the software necessary to add features that allow for gestational and postnatal ages, weight and frequent weight changes in the NICU.

In addressing strategies to assess, monitor, and prevent medication errors in the NICU, a few general points are worth remembering. Research on human factors shows that dedication, training, and vigilance are not enough to prevent errors in complex systems. The approach should be a systems approach. It is a multidisciplinary process and the team of caregivers should be backed up by a robust delivery system and operate in a “*culture of safety*”. Investigation of the circumstances surrounding a medication error should proceed by a root-cause analysis and should be done in a blame-free manner. The first step is acknowledging our fallibility. Prescribing of medications should be done cautiously and without distractions despite the difficulties in achieving this in a busy NICU. Many drugs prescribed in a NICU are used in an off label fashion. There may not be a single comprehensive and authoritative standard for dosage. Thus there may be a number of disparate recommendations from various sources. Employing a single dosing standard may

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mitigate the potential for the occurrence of errors.

What should be done if a patient has actually been given an excessive medication dose? One thing that should *never* be done is to try and hide or obscure the fact from either other responsible caregivers or the parents. Careful recording of the event and the circumstances should be reported. Appropriate exam and studies to assess the effect, if any, of the over dosage should be also recorded in the chart. Monitoring may be required, depending on the specific nature of the mishap. Depending on the nature of the drug and potential side effects, it may well be advisable to have the patient assessed by an appropriate specialist. The parents should be informed of the event, the potential consequences, and of steps taken to assess sequela. This should be done even if there were no adverse medical sequela and the discussion should be noted in the chart. While parents are, naturally, upset or angry that a mistake has occurred, many later come to realize and appreciate the honesty and forthrightness of this approach as strength. Moreover, the NICU population is one of high risk. If the chart is ever examined because of poor outcome (possibly for unrelated, even obstetrical, reasons), an error, which was kept undisclosed, can tarnish the appearance of the whole process and quality of care delivered. We cannot prevent an error once it has occurred. But, and this is the rationale for some of the suggestions made above, once it has occurred, we can demonstrate and document that we reacted in a responsible and appropriate manner.

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ADDRESS CORRECTION REQUESTED

Join us at the Lower Hudson Valley Perinatal Network Education & Networking Meeting on Tuesday, April 19, 2005 9:00 am - 1:00pm at Vassar Brothers Hospital in Dutchess County. For more information call 914-493-6435 or email at Hunter-GrantC@wcmc.com

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<http://www.nymc.edu/neonatology>



