SPA NEWS

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Drs. Anita Honkanen, Maria Osses Cerda, Charles Cote and Lynn Martin share a free moment at SPA's Annual Meeting in New Orleans in October. For reviews of Annual Meeting sessions, turn to page 3.

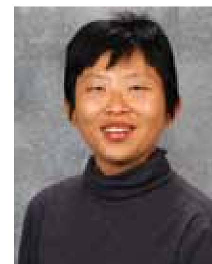
What Anesthesiologists Should Know About the Abused Child

By Gee Mei Tan, MD
Assistant Professor
Anesthesiology Department
The Children's Hospital
University of Colorado School of Medicine

Figures and photos to accompany this article are available on www.pedsanesthesia.org

As anesthesiologists, we are usually not the first line of contact for child maltreatment/abuse cases and thank our lucky stars for that. However, consider this case:

A three year-old girl comes in for an examination under general anesthesia of vagina and biopsy of tissue mass. She presented with frequent blood in her underpants and on investigation a vaginal mass was diagnosed. Biopsy revealed human papilloma virus positive and condylomata/warts.



Dr. Tan

What is the next appropriate step? Who is responsible for following through? What if the surgeon is not interested in consulting child protective services?

Even though we are usually not the initial contact for referrals, we do deal with the aftermath of child maltreatment in operating rooms, including bone fractures, head trauma, burns, etc. We should always be on the lookout for suspicious

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PRESIDENT'S MESSAGE

It was a great pleasure to see everyone who attended the 23rd Annual Meeting of the SPA in New Orleans! New Orleans is certainly regaining strength in its recovery from the catastrophe in 2005 when we cancelled our annual meeting. Registration for the annual meeting topped 270 attendees.

Our program for this meeting was led by Dr. Steve Stayer who did a remarkable job with some slightly alternative presentations. Our hope was to enhance your experience and to allow you to bring home new tools not just in patient care, but in understanding improvements in group practice, changing physician practice, improved safety and outcomes and disaster planning. Congratulations to all our speakers who contributed to a tour de force performance.

Our next SPA meeting will be April 15-18, 2010 in San Antonio, Texas. Along with the spring SPA meeting, we will offer our second Fundamentals of Pediatric Anesthesiology Course. Please make your colleagues aware of both parallel programs if they may be interested in attending. More information is available at our website www.pedsanesthesia.org/meetings. Education continues to be one of our best members' values. Registration for both meetings is available online now.

The SPA continues to have active dialogue with the ASA via the Committee on Subspecialties, and the Committee on Pediatric Anesthesia. Dr. Randy Clark has just completed his term as Chair of the Committee on Pediatric Anesthesia and Dr. Mark Singleton is now assuming duties in this role. Please congratulate them both for their diligent work.

We will be hosting our next Annual Meeting in San Diego per our usual schedule in a joint venture with the Society for Pediatric Anesthesia in New Zealand and Australia (SPANZA) and Dr. Andrew Davidson and Dr. Steve Stayer are the program directors. We are in the early planning stage of an International Assembly on Pediatric Anesthesia for 2012 in Washington, D.C. We'll have more details to follow.

Joseph R. Tobin, MD, FAAP, FCCM
Wake Forest University
School of Medicine
Winston-Salem, NC

It has been a pleasure to have been the President of the SPA this past year and I look forward to further accomplishments in the coming year. The SPA is your society, so please don't hesitate to become more involved in our many committees and educational offerings. Please send me your thoughts (jtobin@wfubmc.edu) of new opportunities we could explore or issues we could address to assist you in your careers advocating for children in the perioperative arena.

FROM THE EDITOR

You may have noticed by now that this newsletter has considerably more content than the usual SPA newsletter. Our hope is that the members are checking the website (www.pedsanesthesia.org) for up to date information and that this newsletter will provide some interesting articles for those who like to have their print in hand.

I want to thank again the ongoing support of the contributing editors to this newsletter, and welcome the new writers. Dr. Tan has written a very interesting article on child abuse and our role as anesthesiologists. There are graphs and pictures that accompany the article and I encourage the readers to go to our website to see the full content with pictures that may have been too graphic for some of our members.

She provides a very thought-provoking overview of this difficult topic that is not commonly addressed in our profession.

Our next edition will start to focus on being green in the OR and how we can contribute to making our environment better by starting at home. If you have any interesting stories or ideas on this topic, please send a note to allison.ross@duke.edu.

I trust everyone had a nice holiday and I look forward to seeing you in San Antonio. Note that the meeting has become so successful that there are educational activities for 4 days. Take a look at the brochure and sign up early. AKR

SAVE THE DATE

International Assembly of Pediatric Anesthesia

October 10 - 12, 2012
Marriott Wardman Park • Washington, D.C.

Meeting Review: SPA 23rd Annual Meeting

Submitted by Shobha Malviya, MD, FAAP, Cheryl K. Gooden, MD, FAAP, David M. Polaner, MD, FAAP, and Allison Kinder Ross, MD

The 23rd Annual Meeting of the Society of Pediatric Anesthesia (SPA) held on October 16, 2009 in New Orleans attracted 270 attendees. Program chair Dr. Stephen Stayer and the education committee put together an exciting program with a focus on practice improvement. The meeting began with welcoming comments from SPA President, Dr. Joseph R. Tobin and from Dr. Stayer.

Dr. James Steven moderated the first session entitled "How to Improve Group Practice". Dr. Sachin Kheterpal kicked off the morning session with an excellent lecture entitled "Beyond the randomized controlled trial (RCT) – The new science of using clinical information systems."

Dr. Kheterpal discussed the use of observational datasets, including clinical registries such as the NSQIP and clinical information systems as important mechanisms that may be used to answer research questions that cannot be answered using an RCT. He emphasized the importance of choosing the research question carefully, identifying a specific event to study, collecting granular detailed data that is easy to enter and testing the data by "hand review."

Next, Dr. Randall Wetzel discussed "Databases for practice improvement: Successes of the virtual PICU (VPICU)." The VPICU in collaboration with the National Association of Children's Hospitals and Related Institutions (NACHRI) provides a common information space for caregivers providing care to critically ill children. In 2005, this project evolved into a not-for-profit limited liability company Virtual PICU Systems, LLC (VPS, LLC).

88 ICUs including 10 international ICUs currently participate, with more than 250,000 cases included in a database growing at the rate of more than 70,000 patients each year.

In his talk entitled "Anesthesia Information Management Systems (AIMS): To improve patient care," Dr. Mohamed Rehman noted the increasing use of AIMS in the U.S. He emphasized the importance of setting up the data warehouse before setting up the anesthesia system and that AIMS was excellent for discrete data but not for text data. Future directions include combining AIMS data with genomics data.

Dr. Randall Brenn concluded this session by discussing his views on "Using Your Electronic Medical Record to improve operational efficiency." He identified three common measures of operating room efficiency including first case start time, turnover time and block utilization. Electronic systems can be used not only to track each of these measures but can also help determine the effectiveness of practice changes by tracking such measures over time.

The second morning session focused on "Changing Physician Practice" and was moderated by Dr. Dean Andropoulos. The first speaker, Dr. Amr Abouleish, presented "Clinical Incentives and Anesthesia Care." He provided an in-depth look at the difference between incentive and variable pay systems.

Dr. Abouleish discussed staffing considerations for the operating room from an anesthesia perspective. He concluded with the realization that "medicine is a science and healthcare is a business."

SPA's 23rd Annual Meeting in New Orleans in October. The educational program focused on practice improvement and boasted an attendance of 270. Speakers included SPA President, Dr. Joseph R. Tobin.

The final speaker for the morning was Dr. Dean Kurth, who presented "Performance Based Privileging." Dr. Kurth provided a comparative overview of the difference between privileging and credentialing. In addition, he focused on the topics of quality assessment and performance management and how each of these impacts the anesthesia provider.

The afternoon began with a session on "Safety as a Motivator for Practice Improvement" moderated by Dr. Steven Tosone. He noted that what we do as pediatric anesthesiologists is accompanied by both great success and great responsibility, thus ongoing improvement of patient safety is a central focus of our professional goals.

Starting the afternoon lectures, Dr. Steven K Howard, a longtime collaborator of Dr. David Gaba's, spoke in his stead on "Crew resource management (CRM)." He began with a history of CRM in both aviation and anesthesia. Accident analyses in aviation found that the crashes in question were the product of dysfunctional communication of the crew, leading to research on the use of simulation with focus on decision making. This work revealed that reducing risk takes practice, and this could be improved through simulation.

The next speaker, Dr. Thomas Shaw, spoke on the topic, "Communication" and the use of standardized handoffs. Dr. Shaw reiterated that communication is a leading cause of medical-related errors and stressed the need for a handoff system that provides responsibility and accountability. Through standardized handoffs, there exists the opportunity to give information and ask questions in an uninterrupted manner that not only improves patient care, but incidentally leads to team-building.

Dr. Eugenie Heitmiller concluded this session on safety and practice improvement by discussing "Checklists." Checklists provide a tool for error management that are a result of communica-

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Meeting Review: ASA Annual Meeting

The following is a sample of the pediatric offerings at the ASA in New Orleans, October 2009. Full content may be found on SPA website, www.pedsanesthesia.org. Edited by Allison Kinder Ross

Luncheon Panel - "Pediatric Anesthesiologist On Call"

Submitted by Olutoyin Olutoye MD
Texas Children's Hospital

The first speaker was Dr. Ann Bailey who spoke on Pyloric Stenosis. Pyloric stenosis is more common in males (4:1) and usually presents within first six weeks of life. Its etiology has been related to extrinsic factors such as maternal smoking, erythromycin use and maternal stress. A decrease in neuronal nitric oxide in the muscle layer of the mesenteric plexus is believed to be responsible for spasm of the pylorus. Presentation is with projectile, non-bilious vomiting after feeds.

Only 10% of affected children now present with severe metabolic derangements and diagnosis is now at 3.4 weeks of life with a shorter period of hospitalization. Children with extreme dehydration receive 20 cc/kg of isotonic fluid. Mild to moderate dehydration is best treated with D5 1/4 normal saline with 20 meq of KCl at 1.5-2 times the rate of maintenance. Metabolic derangements usually include hypochloremia, however, as children are now presenting with a well hydrated status, increased bicarbonate, hypovolemia and occasional hyperkalemia are being observed.

Patients are optimized for surgery when adequate hydration has occurred and chloride and bicarbonate levels have normalized. Anesthetic management begins with decompression of gastric contents since a residual gastric volume of 4.8 cc/kg exists. Rapid sequence induction is most common technique, but oxygen desaturation < 90% may occur. In this same study, awake intubation was found to be associated with prolonged intubation times. If ventilation is instituted before intubation, low inspiratory pressures are used.

Desflurane has been shown to result in a shorter time to extubation. Postoperative pain is very minimal particularly when local anesthetics are infiltrated intra-operatively. Postoperative apnea is a consideration

The second medical condition involved care of the Incarcerated Hernia and was presented by Dr. Peggy Seidman. The incidence of incarcerated hernia is 1-5% in a lifetime with a highest occurrence in the first year of life, and 1/3 occurring in premature babies or those under 6 months of age. Risk factors include prematurity, undescended testes, abdominal wall defects, ventriculo-peritoneal shunts and bladder extrophy.

Initial treatment is by manual reduction with ninety-five percent being successful so that the child is discharged home with plans for elective surgical repair. Recurrent incarceration occurs 30% of the time. Unsuccessful reduction results in a surgical emergency. Anesthetic management includes rapid sequence induction, and if severe sepsis is present, the placement of an arterial line and possible post operative recovery in the intensive care unit. Management of post operative pain can be via infiltration of local anesthetics, intravenous administration of opioids or by placement of regional caudal blocks.

The third and final emergency presented involved Aerodigestive Tract Foreign Bodies and was presented by Dr. Robert Holzman.

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SPA Meeting Review, *from page 3*

tion error. She gave examples of using checklists in the ICU to reduce length of stay and bloodstream infections. Both of these incidentally also lead to a significant reduction in hospital costs.

The fourth session of the day, "Disaster-Lessons Learned from Katrina," was moderated by Dr. Alfred Dorsey. This session began with Dr. Charles Fox, who presented a very sobering talk, "The Katrina Experience," that focused on clearly defining the basic responsibilities of a hospital facing a natural disaster.

Dr. Fox outlined the potential barriers to success that included inadequate communication, the need to house essential personnel only, and issues surrounding water and power supplies.

Wrapping up the day's lectures was Dr. Paul Sirbaugh, who spoke on the topic, "Resource Utilization in Disasters." Dr. Sirbaugh, a pediatric emergency room physician, incorporated the lessons learned from Katrina into disaster preparedness, and related it to other crises including the present issue of H1N1. He outlined options for responses to large-scale illness that included basics on triage, personnel and facility flexibility that provided a very practical approach for the audience who may also face similar situations.

Exciting upcoming educational opportunities sponsored by the Society include the Fundamentals of Pediatric Anesthesiology, a program designed for the generalist, to be held in conjunction with the winter meeting in San Antonio on April 17 - 18, 2010. The winter meeting will also feature an educational program by the Congenital Cardiac Anesthesia Society, a PALS course and advanced ultrasound guided regional anesthesia workshops to meet the needs of the membership. Additionally, the SPA will hold a joint annual meeting with the Society of Pediatric Anesthesia of Australia and New Zealand to be held on October 15, 2010 in San Diego. Additional information may be found on the SPA website at www.pedsanesthesia.org.

The anesthesia literature does not support a particular anesthetic technique. Spontaneous ventilation under deep anesthesia appears to better for retrieval of foreign objects. Supplemental topical anesthesia prior to the beginning of the operation provides excellent conditions for examination of the larynx and subglottic area. Existing controversies in the management of patients with foreign bodies include: use of anti-cholinergics and/or succinycholine, proceeding with surgery on a full versus empty stomach, controlled versus spontaneous ventilation and deep or awake extubation. Anesthesiologists are encouraged to take on more of a policy role in delineating unsafe/hazardous environments with potential for accidental ingestion of foreign bodies.

Panel-"Everyday Regional for the Pediatric Patient"

Submitted by Sean Flack, MB, ChB, FCA, DA
Seattle Children's Hospital

Following a brief update of data from the Pediatric Regional Anesthesia Network by moderator Dr. Santhanam Suresh, the panel began with Dr. Navil Sethna discussing single-dose caudal anesthesia/analgesia. 0.7 ml/kg local anesthetic provides approximately 4 hours of analgesia for T10 while 1 ml/kg achieves a T6 dermatomal level.

A high volume/low concentration technique (1.5 ml/kg 0.15% ropivacaine) was recently shown to provide superior analgesia compared with a low volume/high concentration technique (1.0ml/kg 0.225% ropivacaine)[1]. It has been suggested that competency in performance of caudal blocks is achieved after approximately 30 placements. Serious complications may occur.

The most common technique for caudal placement is use of an intravenous cannula (70%) versus hollow needle (16%) or styletted needle (14%). Tissue coring during caudal placement is common with the use of an intravenous cannula but the clinical implication of this finding remains to be determined. Bupivacaine or levobupivacaine are the local anesthetic of choice in 85% of caudals while clonidine is the most common adjuvant. Block duration may be extended by clonidine (1-2 mcg/kg) or preservative-free ketamine (0.25-0.5mcg/kg). Evidence that adjuvants improve outcomes is lacking and neurotoxicity risks are unknown for some agents, including ketamine. Also, preservative-free ketamine is unavailable in the USA.

Dr. Patrick Birmingham followed with a presentation titled "Beyond the single shot caudal: epidural catheters". Sedation or anesthesia for epidural placement has been standard of care in children and a recent consensus statement concluded that "the benefit of ensuring a cooperative and immobile infant or child may outweigh the risk of performing neuraxial regional anesthesia in pediatric patients undergoing general anesthesia or heavy sedation"[2]. 2% chlorhexidine in 70% propyl alcohol is the antiseptic of choice, however it is not approved for use in infants aged <2 months. Caudal catheters may be used to achieve lumbar or thoracic analgesia in children aged <5. Adequate initial dosing (0.5-1 ml/kg 0.25% bupivacaine) was recommended followed by a starting rate of 0.2 ml/kg/hr. Common infusate choices include 0.1% bupivacaine and 0.2% ropivacaine with popular adjuvants including fentanyl (1-5mcg/ml), hydromorphone (2-5mcg/ml), morphine (5-10mcg/ml) or clonidine (0.5-1mcg/ml). All patients receiving neuraxial opioids should be monitored for adequacy of ventilation and with pulse oximetry. Evidence for epidural abscess or hematoma includes local tenderness, radicular pain, sensory loss or paraplegia, urinary retention or incontinence, myelographic defect and MRI evidence for a localized lesion. Differences between these two complications include fever and raised WBC count in the presence of an abscess. Patient as well as nurse/parent-controlled epidural analgesia is feasible in children provided standard management protocols are followed[3,4]. Good outcome data regarding epidural analgesia versus intravenous opioids in children remains elusive.

Finally, Dr. Sean Flack recommended four peripheral nerve blocks that may be added to the armamentarium of an everyday pediatric regionalist. These included the supraclavicular approach to the brachial plexus, rectus sheath block, ilioinguinal/iliohypogastric nerve block and the femoral nerve/fascia iliaca block. These blocks are frequently used in children and are easily learned and performed, with ultrasound guidance.

References 1) Breschan et al, Pediatr Anaesth 2005; 15:301-306, 2) Bernards et al, RAPM 2008; 33:449-460, 3) Birmingham et al, Anesth Analg 2003; 96:686-691, 4) Monitto et al, Anesth Analg 2000; 91:575-579.

Panel: "Tonsillectomy for the Pediatric Patient"

Submitted by Cheryl K. Gooden, MD, FAAP
Mount Sinai Medical Center

Moderated by Dr. Wendy Binstock, this panel provided an overview of important issues related to the care of the pediatric patient undergoing tonsillectomy. The first speaker, Dr. Karen Brown, presented "Pre-operative Evaluation for Obstructive Sleep Apnea." Dr. Brown provided an informative overview of the features and pathophysiology of childhood obstructive sleep apnea syndrome. She discussed the various options available for the evaluation of OSA. The "gold standard" for diagnosing OSA in children continues to be polysomnography. Dr. Brown highlighted the respiratory events and implications as seen during polysomnography.

Dr. Gregory Schears presented "Post-operative Pain and Bleeding." Dr. Schears elaborated on these topics through a detailed review of the current literature including techniques utilized by the surgeon and anesthesiologist to reduce pain and bleeding in this group of patients. Dr. Schears highlighted a few newer treatment options for pain that are currently available or soon to be available in the USA.

The final speaker in this panel was Dr. Cheryl Gooden, who presented "Post-operative Nausea and Vomiting." Dr. Gooden discussed the terminology, incidence, impact and pharmacoeconomics associated with PONV. The physiology of emesis as well as the role of genetics in antiemetic therapy was examined. In addition, she explored the various risk factors and treatment options for PONV in pediatrics.

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The Significant Pediatric Anesthesia Articles of 2009: The Editors Opine

Submitted by Barry David Kussman, MB, BCh
Boston Children's Hospital

In a panel moderated by Linda J. Mason, MD, pediatric editors from Anesthesiology (Jerrold Lerman, MD), Pediatric Anesthesia (Robert H. Friesen, MD), Anesthesia & Analgesia (Peter J. Davis, MD), and Pediatrics (Zeev N. Kain, MD, MBA) discussed articles within the past year that each considered relevant to our practice.

Dr. Lerman focused solely on the topic of anesthetic agents and the relationship to apoptosis in the developing brain. Three invited editorials discussed issues relating to anesthetic neurotoxicity; the molecular mechanisms and relevance to humans (Anesthesiology 2009;110:703), the role of randomized controlled clinical trials to study the question (Anesthesiology 2009;109:941), and insights from epidemiologic database studies (Anesthesiology 2009;109:1). In Dr. Lerman's opinion, the two retrospective database studies (Wilder et al. Anesthesiology 2009;110:796 and Kalkman et al. Anesthesiology 2009;110:805) were suggestive by not confirmatory of the neurotoxicity of anesthetic agents demonstrated in animal studies. Of three rodent studies, lithium was found to attenuate the apoptotic effects of ketamine and propofol (Anesthesiology 2009;110:862), dexmedetomidine attenuated isoflurane-induced injury in the developing brain (Anesthesiology 2009;110:1077), and that hypercarbia may partly cause isoflurane-induced brain cell death (Anesthesiology 2009;110:849). Dr. Lerman drew attention to a rodent study (Neonatology 2009;96:23) that found that high dose $MgSO_4$ caused apoptotic injury, which is in contrast to the neuroprotective role of Mg at low doses. The reader is referred to a study in twins (Twin Research and Human Genetics 2009;12:246) that monozygotic twins discordant for having received anesthesia have equivalent levels of learning-related outcomes.

Dr. Friesen recommended that pediatric anesthesiologists read two articles - an editorial relating to intravenous neonatal paracetamol (acetaminophen) dosing (Pediatr Anesth 2009;19:289), and a review article defining what a reviewer of a submitted manuscript wants in order for authors to write better papers and design better research studies (Pediatr Anesth 2008;18:1149). Although the results of a study comparing propofol with pentobarbital for pediatric MRI sedation were predictable (Pediatr Anesth 2009;19:601), the study demonstrated the power and effectiveness of multicenter databases to investigate clinical issues. A study of the Cerebral State Index in infants undergoing herniorrhaphy found that spinal anesthesia (0.5% levobupivacaine 1mg/kg) is associated with sedation (Pediatr Anesth 2009;19:133). A focused study to address an important and relevant clinical question, the impact of LMA cuff pressures on the incidence of sore throat in children, found an 11% incidence that was related to higher LMA cuff pressure (no sore throat with pressure $< 40cmH_2O$) and less sore throat with silicone (vs. PVC) (Pediatr Anesth 2009;19:464).

Dr. Davis presented two areas of pediatric anesthesia in which any discussions 'have no ending'. A non-randomized study in children under 5 years undergoing rigid bronchoscope for foreign body removal found 5 risk factors for hypoxemia – spontaneous ventilation (vs. controlled ventilation with a muscle relaxant), younger age, plant seed, longer surgical duration, and preexisting pneumonia (Anesth Analg 2009;109:1079). The second area of practice discussed pertained to whether certain conditions are associated with malignant hyperthermia or not. The audience was referred to the October 2009 issue of Anesthesia & Analgesia in which there were multiple articles on MH. It was pointed out that contracture testing has only been validated in normal people, thus making it more difficult to interpret these tests in the setting of myopathies. In most conditions there is only weak evidence for MH susceptibility.

Dr. Kain presented a study evaluating the influence of APOE gene polymorphisms on behavior after infant cardiac surgery. They found that in pre-school age children the APOE $\epsilon 2$ allele was associated with increased behavior problems, impaired social interactions, and restricted behavior patterns (Pediatrics 2009;124:241). A French study comparing behavioral problems at 5 years of age found that preterm children had significantly more behavioral problems (twofold), that behavioral problems were strongly related to cognitive impairment, but still persisted with adjustment for cognitive dysfunction (Pediatrics 2009;123:1485). A very interesting study of postoperative pain in children undergoing tonsillectomy and adenoidectomy found that children are in significant pain and, particularly those being sent home on the day of surgery, receive inadequate analgesia (Pediatrics 2009;124:e588).

OBITUARY: Dr. Robert M. Smith

Dr. Robert M. Smith, who passed away on November 25 at the age of 96, was one of the most distinguished pioneers of pediatric anesthesia in the world. He was a great educator and his pediatric anesthesia fellowship program with intimate bedside teaching at the Children's Hospital in Boston is one of the oldest programs in North America. Dr. Smith advocated patient safety with compassion long before the terminology became fashionable or even existed. At a time when anesthesia monitoring consisted primarily of simple visual observation of the anesthetized child, Dr. Smith initiated the concept of physiological monitoring, by making use of the precordial stethoscope and pediatric and neonatal blood pressure cuffs (Smith cuff), initially hand-made in his garage, as standards of anesthetic care. In 1959, Dr. Smith wrote the first major comprehensive textbook specifically dedicated to the anesthetic management and care of children, titled Anesthesia for Infants and Children. In 1990, after the fourth edition by Dr. Smith, the fifth editon was renamed Smith's Anesthesia for Infants and Children, when Dr. Smith passed the baton to Dr. Etsuro K. Motoyama, his former associate, and Dr. Peter J. Davis, who expanded the book to a scholarly multi-authored text. Dr. Smith's legacy and basic message of safety and compassion for children are continued today in the longest surviving publication in pediatric anesthesia in the span of over 40 years.

signs and symptoms of maltreatment and be advocates for our patients by knowing who and where to bring our suspicions to.

Battered Child Syndrome[1] was coined in 1962 by Kempe et. al. to characterize a group of children suffering physical harm as a result of intentional acts of violence perpetrated by custodians. Child maltreatment has been divided into two main subsets: physical abuse, and neglect. Physical abuse is defined as physical, mental injury or sexual abuse of a child under the age 18 by a person who is responsible for the child's welfare. Neglect occurs when a care provider responsible for a child either deliberately or by extraordinary inattentiveness permits a child to suffer, or fails to provide conditions generally deemed essential for developing a child's physical, intellectual or emotional capacities.

The National Child Abuse and Neglect Data System (NCANDS)[2] is a federally sponsored effort which collects and analyzes data annually regarding child maltreatment submitted voluntarily by the States, the District of Columbia and the Commonwealth of Puerto Rico. The annual reports can be found online at http://www.acf.hhs.gov/programs/cb/stats_research/index.htm#can. The 2007 report states that the rate of confirmed child abuse is 10.6/1000 US children. Of these, the majority were due to neglect followed by multiple maltreatment, physical abuse and sexual abuse (fig 1). The mortality rate from maltreatment is 2.35/100,000 children. These rates have been increasing for the past years which are a huge concern. At the Children's Hospital of Denver, data has shown that non-accidental trauma (NAT) death has been the top ranking cause of all trauma deaths since 2003. Children three years and under are at the highest risk for maltreatment and subsequent mortality (Fig 2, 3). Tragically, parents, especially mothers, are by far the most common perpetrators and cause the highest mortality (fig 4). Children of certain race and ethnicity have different risks for maltreatment; highest in African-Americans and lowest in Asians (Table 1).

In order to raise suspicions of child maltreatment, we need to be aware of who are at risk. These would include children born with physical or developmental disabilities, children born to single parents who are themselves younger, lesser-educated with less/no prenatal care and children with a family history of violence or other abused siblings. In order to determine between accidental and maltreatment, taking a good history is of utmost importance. We need to inquire into the family history for high risk environment. Decide if the story given by caregivers is consistent and plausible for the injury that the child has suffered. A 6-month old child will not be climbing a flight of stairs and accidentally fall down the stairs leading to multiple fractures. Determine the demeanor and body language of the caregivers; are they defensive, violent, hostile or passive? Physical examination, imaging techniques and laboratory testing will help us further confirm our suspicions.

We must remember that every bruise, burn or fracture we come across will have differential diagnoses and it is important to exclude them before labeling them as NAT because this has significant consequences for the child and family. Bruising from physical abuse tends to be bilateral, widespread and on soft tissue areas (e.g. inner thighs, axillary regions) that do not usually come in contact with hard surfaces on falling. It can take specific shapes like belt whips, finger and hand marks, and pipes. Multiple bruises with different colors representing different time frames of bruising may point towards NAT. One must be more vigilant in children with darker skin pigmentation as the bruises may not show up well (Fig 5). Inflicted burns are recognized by causing specific patterns and shapes like cigarette butts (8mm round) and hot iron. Immersion of children in hot fluids usually present with bilateral burns of equal severity (thickness of injury), usually of palms or lower half of body with sparing of the flexor creases because the child would be pulling up their legs to avoid the hot fluid (fig 6). In order to determine if fractures are caused by NAT, one has to find inconsistencies between mechanism of injury as stated by caregivers and the fractures inflicted. The developmental stage of the child has to be taken into consideration too. Young non-ambulatory children do not usually present with long bone fractures, especially spiral fractures. Fractures of posterior ribs and spinous processes of the vertebrae are highly suspicious of abuse because the proposed mechanism of injury is unlikely to happen accidentally. Metaphyseal fractures of long bone from shearing forces can occur when a child is shaken with arms and legs flailing forcefully during the event. Multiple fractures in different healing stages should also be investigated for NAT.

There are medical conditions that predispose children to suffer injuries under minimal traumatic conditions or conditions that has presentations that mimic NAT (See Table 2). Some cases of maltreatment may not be obvious thus leading to delay in the diagnosis; these include the child presenting with failure to thrive, poisoning and Munchausen by proxy. Some traditional medical therapies lead to multiple bruises and these should be differentiated from maltreatment (Fig 7, 8). Children who are denied westernized standard of medical care (e.g. vaccination, blood transfusion) by their parents due to their beliefs may be controversial. Does this point to neglect?

Diagnosis of shaken baby syndrome (SBS) is made in the presence of subdural hemorrhage, retinal hemorrhage and skeletal injuries. However, not all three signs need to be present for the diagnosis[3]. Cranio-cerebral trauma caused by SBS is the most common cause of morbidity and mortality in physically abused children. The infant brain contains 25% more water than the adult brain and has lesser or no myelin protection leading to a much softer and gelatinous texture and thus more fragile. The infant's neck muscles are not strong enough to support the relatively larger head and thus allow a broader range of movement when shaken. Infants less than 1-year old are at greatest risk for SBS and the leading cause of the shaking is inconsolable crying. The Children's Hospital of Denver and the Kempe Center in Colorado, together with Kohl's, has developed an educational video "Crying happens. What's your plan?" which focuses on the dangers of SBS and that crying is common. Shaking of the child leads to contact (e.g. against a wall) or non-contact (acceleration and deceleration) injuries[4].

There are several postulated mechanisms for the above:

- The accelerating and decelerating rotational forces cause the bridging veins to rupture leading to subdural hematoma
- The brain hitting the inner skull is directly traumatized leading to cerebral edema
- The axons may be sheared off during the aggressive movements leading to diffuse axonal injuries
- Asphyxiation and hypoxia further aggravates the problem by causing release of vasoactive substances leading to more cere-

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PRO

The Epinephrine Test I

By Karene Ricketts, MD
University of North Carolina Children's Hospital

Introduction

One of the time-honored methods of identifying accidental systemic injection is the "test dose" (1). The purpose of the "test dose" is to allow the detection of needles / catheters misplaced either intravascularly, intraosseously, subdurally, or intrathecally thereby avoiding the consequences of injecting a critical amount of local anesthetic (2). The "test dose" contains epinephrine that theoretically if injected systemically will cause tachycardia and hypertension (1). In 1981, Moore and Batra (3) proposed lidocaine 45 mg with 15 µg of epinephrine as the ideal adult epidural test dose and defined a positive response in adults as an increase in heart rate of ≥ 30 bpm (1, 2). This criteria was initially extrapolated to the pediatric population where it was found to be unreliable and its validity was questioned by Desparmet et al. in 1990 (1, 4).

Evidence Supporting the Epinephrine Test Dose

Research focus shifted to determining if the epinephrine test dose criteria could be improved in the pediatric population. Tanaka and Nishikawa (5) performed a study on sixty ASA I infants and children (4.1 +/- 2.5 yr) undergoing elective minor surgeries under 1 MAC sevoflurane anesthesia in 60% nitrous oxide and oxygen. The patients were randomly assigned to 1 of 4 groups: saline alone, a test dose consisting of epinephrine 0.5 µg/kg in 1% lidocaine (1mg/kg), atropine 0.01 mg/kg followed 5 min later by saline, or atropine followed by the test dose. The test dose was delivered via a peripheral vein to simulate intravascular injection of the epidural test dose. Only 8 of 15 patients pretreated with atropine and 10 of 15 who did not receive atropine developed an increase in HR of ≥ 20 bpm after the test dose. These results indicated that an epidural test dose containing epinephrine was unreliable based on the conventional HR criterion (positive if ≥ 20 bpm). However they found that if they used modified criterion of an increase in heart rate of ≥ 10 bpm, that they had 100% reliability such that ALL the children in the test dose alone (15/15) and test dose plus atropine (15/15) groups had positive results. When they evaluated an increase in systolic blood pressure of ≥ 15 mmHg, all (15/15) patients that received test dose plus atropine pretreatment met the criteria whereas 10 of 15 who received only the test dose did. This implied that when the test dose was preceded by atropine it too may be a reliable indicator for detecting intravascular injection.

There had also been reports in the literature of T wave changes after inadvertent systemic injection of local anesthetic and epinephrine. Fisher et al. (6) suggested adding changes in T-wave amplitude (an increase by ≥ 25%) as a criteria for identifying inadvertent systemic injection after observing such T-wave changes in 25 of 30 patients who had known intravascular injection of local anesthetic and epinephrine. Subsequently Tanaka and Nishikawa (7) performed a study to evaluate the following epinephrine test dose criteria: changes in heart rate ≥ 10 bpm, systolic blood pressure ≥ 15 mmHg, and T-wave amplitude ≥ 25%. The study was performed in 32 ASA 1 children (3.4 +/- 1.7 yrs) undergoing minor elective surgeries under 1 MAC sevoflurane anesthesia in 67% nitrous oxide and oxygen. All patients received atropine (0.01 mg/kg) pretreatment before being randomly assigned to receive saline placebo versus the simulated intravascular (intravenous) test dose of 0.5 µg/kg of epinephrine in 1% lidocaine (1mg/kg). None of the 16 children who received the placebo had any changes; but of the 16 children that received the test dose, all 16 met the aforementioned heart rate and T-wave criteria and 13 of 16 met the systolic blood pressure criteria.

There were some who believed that the ECG changes were related to the local anesthetic and not the epinephrine test dose, but a similar study performed by Kozek-Langenecker et al. (8) provided evidence against that. They studied 42 children (0.5 – 8 yrs) anesthetized with either 1 MAC halothane (n=21) or sevoflurane (n=21) in 70% nitrous oxide and oxygen. Each patient received two test doses injected intravenously to simulate the intravascular administration of an epidural test dose. One test injection consisted of epinephrine 0.5 µg/kg, while the other test injection consisted of saline. Local anesthetic was not administered with the test dose and there was no atropine pretreatment. A positive test response was defined as a change in T wave amplitude ≥ 25%, systolic blood pressure increase ≥ 15 mmHg, and heart rate increase ≥ 10 bpm. A positive response rate to epinephrine was noted in 100%, 95%, and 71% of children anesthetized with sevoflurane respectively, and 90%, 71%, and 71% of children anesthetized with halothane respectively. They concluded that there was greater reliability of the T wave criterion versus blood pressure and heart rate criteria for detecting intravascular injection of a simulated epidural test dose.

Conclusion

The controversy and disillusion with the epinephrine test dose stemmed from misapplication of extrapolated adult criteria to the pediatric population (1). It is vitally important to be aware that adults and children differ with regard to pharmacology, physiology, and appropriate dosing (9). The current literature supports the use of an epinephrine test dose of 0.5 mcg/kg using the pediatric criteria (listed in order of most sensitive to least) of an increase in T-wave amplitude of ≥ 25%, an increase in heart rate of ≥ 10 bpm, or increase in systolic blood pressure of ≥ 15 mmHg. When utilizing the appropriate criteria, the epinephrine test dose has a risk / benefit profile that supports systematic use during the performance of regional blockade in children.

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Dose: Reliable or Not?

CON

By Laurilyn Dee Helmers, MD
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Safety is one of the cornerstones in the provision of anesthesia to our patients. Over the past ten to fifteen years, evidenced-based medicine has been embraced to guide our decision-making in how we provide that care. In the realm of epinephrine-containing test doses for regional anesthesia, our goal to attain the former has not always been achieved convincingly via the latter. The cardiovascular and neurologic consequences associated with an intravascular injection of local anesthetics are significant and we continually look for methods to prevent these sequelae.

The use of test doses of epinephrine to ascertain the presence of an intravascular placement has been ingrained into our clinical practice and teaching. A "test dose" was discussed as early as 1954 in Bromage's textbook. In 1981, Moore and Batra (3) described a proposed 'ideal test dose' in the awake adult population, utilizing lidocaine and epinephrine to avoid aberrant injection of local anesthetic into the intravascular, subdural, or intrathecal spaces; the mean maximum heart rate increase was more than 30 bpm . In numerous areas of anesthesia, practices advocated for adults have often been extrapolated to the pediatric patient. A number of clinical studies have investigated this practice in children and case reports and review articles utilizing that information have appeared in the literature. A study by Desparmet et al in 1990 showed that a heart rate increase would be seen with a simulated test dose of 0.1ml/kg of 1% lidocaine with 1:200,000 epinephrine (0.5mcg/kg), in the presence of halothane, but atropine premedication was required to increase the sensitivity (4). An observational study by Fisher et al in 1997 (6) showed a variety of ECG changes noted during a epidural test dose administration (if used, general anesthesia was not "controlled"); these ECG changes included HR increases of 10 bpm, but HR decreases were also noted (baroreceptor response suggested as the possible mechanism). The study investigated the value of assessing the presence of a ST- and T-wave changes and noted the occurrence of T-wave amplitude changes in 25/30 patients--another ECG change to identify, but with decreased sensitivity. In a study by Tanaka et al in 1998 (5), the same simulated test dose used in the previous studies was studied in the presence of sevoflurane and atropine premedication; this showed good sensitivity and specificity when the HR increase criterion was "modified" to 10 bpm, but had a diminished sensitivity and negative predictive value with SBP increase or HR increase of 20 bpm. Tanaka's group published additional studies, addressing some of the variables associated with the test dose (anesthesia technique, epinephrine dosage, T-wave amplitude, etc) which produced relatively similar findings.

All of these investigations can certainly provide information to support the use of epinephrine test doses; unfortunately, the information can also make that practice "less definitive." The results can be confusing and do not always support the establishment of guidelines to endorse its use in the placement of all regional anesthetic procedures. What is the "ideal test dose?" A number of components of the "test dose" have been evaluated and yet no "universal test dose" has been documented by those who incorporate it into their "standard practice" or research algorithms. What is the appropriate epinephrine dose? Does the presence of local anesthetics impact the accuracy of the evaluation and does it vary with different agents? When placed after the induction of general anesthesia, does the presence of sevoflurane vs. halothane vs. isoflurane +/- nitrous oxide impact the reliability of the test? What is the assessment that will indicate a "+" response: HR increase of 10bpm or 20bpm; R to R rate; T-wave amplitude—use of a monitor only or requires a paper tracing; SBP increase? Should we use one result or is a combination of results necessary to ascertain a "positive test dose?" With so many components included in the assessment, should we extrapolate acid-base status, coexisting disease, patient position, placement of ECG leads, ECG lead monitored, or any of the various elements of our balanced anesthetic among those factors to identify which may impact the local anesthetic and epinephrine test dose responses?

In 2005, Sethna and McGowan published an editorial in *Pediatric Anesthesia* addressing these same concerns, advocating the use of "common sense" and appropriate technique, without dependence on the performance of a test dose to rule out an accidental intravascular placement (10). They also commented that a positive response may indicate an erroneous placement, but its absence certainly did not exclude it.

The presence of false positives and false negatives for this practice make it difficult to require its use for every regional anesthetic. While management of the placement may be modified in the presence of a "positive" response, the accuracy of this management may be left more to conjecture than to science. Case reports have been published which describe unrecognized intravascular placement of epidural catheters despite the use of test doses. Intermittent dosing should be encouraged in any regional anesthetic technique as well as ensuring the use of appropriate techniques. Using doses that concur with recommended guidelines and recognizing the potential for absorption also needs to be emphasized, as toxic reactions can occur at a time remote to the placement of these regional anesthetics.

In regard to the advocated practice of using epinephrine-containing test doses for accurate regional anesthesia placement, I might suggest that we are charlatans, utilizing the mystique of pharmacology and physiology to substantiate our view, with conflicting 'evidence' to persuade us to incorporate it as a "requirement for standard practice." Instead of a role as the "ultimate confirmation," its use should be one of many elements to facilitate safe practice in placing regional anesthetics in our pediatric patients. My concern is that the illusion of the presumed safety associated with the performance of an epinephrine test dose might indeed be as much "magic" as science.

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Statement on Preventing Wrong Side Procedures

By Donald C. Tyler, MD, MBA

WAKE UP SAFE, a component organization of the Society for Pediatric Anesthesia, is a newly formed Patient Safety Organization, listed by the Agency for Healthcare Research and Quality, and partially supported by the Anesthesia Patient Safety Foundation and ten founding pediatric institutions. The goal of WAKE UP SAFE is to create a registry of significant adverse events that occur during pediatric anesthesia, to learn from the events, and to disseminate suggestions for improvement.

Five cases of wrong side procedure were recently submitted to the WAKE UP SAFE registry. These events all occurred during the year 2008. There were two wrong side regional blocks and three wrong side surgical procedures. Even though the registry was not yet fully functional in 2008, the approximate yearly case total was 145,000 for the institutions reporting, thus the incidence of wrong side procedures among the reporting institutions was 1/29000 anesthetics. Although the incidence seems high, there is also a high incidence of wrong side surgery and blocks reported in Pennsylvania1, and also in the United Kingdom[2,3].

The reports indicate that for the wrong side blocks there was no formal "time out" prior to the block. For the surgical procedures, although the Universal Protocol was in place, it was not strictly followed. Several protocol violations were noted, including the side of the procedure not indicated on the consent, the site marking not visible after the patient was prepped and draped, and failure to display appropriate images.

After review of these cases the following points can be made:

1. Wrong side procedures can and do occur in major pediatric hospitals.
2. A formal "time out" is necessary prior to regional anesthesia procedures.
3. Having a universal protocol for procedures is not enough. The protocol must be followed. Failure to follow protocol is a common problem in the Pennsylvania reports4.
4. Teamwork among nurses, anesthesiologists and surgeons is an important component in preventing wrong side procedures.

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Abused Child, *from page 7*

bral edema

- All the above leads to raised intracranial pressure, herniation and eventually death if not treated.

Signs and symptoms of cerebral injury from SBS present immediately and may peak in 4-6 hours. There can be a wide range of symptoms and signs depending on the time and severity of shaking and whether impact was present.

These include:

- " not acting right"
- Poor feeding
- Vomiting
- Irritability
- Lethargy
- Seizure
- Apnea
- Altered level of consciousness
- Unexplained infant death
- Possible "SIDS"
- Visual impairment

Of interest is the finding of retinal hemorrhages in an infant presenting with the above symptoms and signs. Retinal hemorrhage has an incidence of 50-80% in SBS; if bilateral, the incidence increases up to 90%. In SBS, retinal hemorrhages are usually multiple, different shapes, widespread over the retina, involve multiple layers of the retina and may not be associated with papilloedema.

Child maltreatment can present with many different and sometimes subtle clinical symptoms and signs. It can lead to morbidity (mild learning disabilities to severe physical and cognitive abnormalities) and mortality. Only when we, the physicians, are educated and aware of it can we raise suspicions. A team effort consisting of physicians, paramedical professionals, social workers and child protective services would be needed to confirm the diagnosis. Prevention of child maltreatment includes early detection of increased risk environment, parenting education and community related support for the caregivers.

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Please visit **www.pedsanesthesia.org** for tables, charts and photos.

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What's New in Pediatric Airway Management: Pediatric Airtraq® optical laryngoscope

By Helen V. Lauro, MD, MPH, FAAP

Recently joining the airway armamentarium in infant and pediatric sizes (Figure 1) are the pediatric Airtraq® optical laryngoscopes (Prodol Meditec S.A., LLC, distributed by King Systems, Noblesville, IN).

The Airtraq® is comprised of two channels, one of which contains battery powered optical components and the other which mounts the endotracheal tube (ETT). The product's optical design is analogous to that of a submarine periscope. During laryngoscopy, indirect visualization of the glottis and surrounding structures is achieved through a magnified angular view using lenses, prisms and mirrors which reflect the image from the distal tip of the blade to a proximal viewfinder. (1) The patient's head should start in "neutral" position, since need of a sniffing position to align the oral, pharyngeal, and tracheal axes is obviated by the pronounced curvature of the Airtraq® blade. The device is easiest to use as a Macintosh laryngoscope blade, that is, placed in the vallecula and above the epiglottis, with the ETT subsequently guided through the vocal cords and finally disengaged from the Airtraq® by moving laterally. (2)

Figure 1

Figure 2

Figure 3

A Medline search did not reveal any pediatric randomized controlled trials of Airtraq® conducted against alternative indirect laryngoscopes, but the device may be considered for the pediatric difficult airway cart as the device has been successfully utilized in Robin sequence and Treacher Collins patients. (2,3) Placement problems such as posterior displacement of the tip of the ETT during intubation with the Airtraq® have been described (4) which can be corrected by jaw thrust or manipulation to achieve optimal positioning of the glottis in the middle of the viewfinder ("Airtraq®" grade 1 view) (5), use of a styletted ETT in the tube conduit (Figure 2a, 2b), withdrawal of device 1-2 cm from glottis and lifting the device up, or use of the alternate Endoflex® ETT which works over a range of angles. (6) A minor caveat is that the light on Airtraq® needs to be turned on 30-45 seconds before use to allow the lenses to warm up and avoid fogging.

The product is disposable and costs about $80 with a shelf life of three years. (7) The manufacturer recommends a learning curve of 2-4 uses before using in a difficult airway. Available in three pediatric sizes: infant (size 0, gray-coded, minimum mouth opening 12.5 mm, accommodates ETT ID 2.5- 3.5 mm), pediatric (size 1, pink-coded, minimum mouth opening 12.5 mm, accommodates ETT ID 3.5-5.5 mm), and small adult (size 2, green-coded, minimum mouth opening 16 mm, accommodates ETT ID 6.0-7.5 mm).(8)

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What is it Like to be a Malignant Hyperthermia Hotline Consultant?

By Tae W. Kim, MD, FAAP

The short answer to the question in the title, according to MHAUS, is that Malignant Hyperthermia Hotline Consultants are "Physicians who specialize in MH crises treatment 24 hours per day, 365 days per year...provide added expertise and support to medical professionals in successfully managing an MH crisis or to answer pre, post or intraoperative anesthesia questions." There are 29 MH Hotline Consultants as of this writing that are available at 1-800-MH-HYPER.

The longer answer to the question requires a bit more personal history. My first encounter with a patient experiencing malignant hyperthermia (MH) was not my own. An anesthesia colleague was caring for a young child having an exploratory laparotomy under general anesthesia. During the procedure, the anesthesiologist noted an increasing end-tidal carbon dioxide unresponsive to increases in minute ventilation. In addition, the patient became hyperthermic and rigid. A code was called and everyone quickly responded.

The MH episode was quickly treated with dantrolene sodium while following the steps outlined by the Malignant Hyperthermia Association of the United States (MHAUS) in the MH protocol. This was my first personal experience with this rare disease unique to the practice of anesthesia. In addition, my first interaction with a MH Hotline Consultant was related to this event. I remember a very calm, professional voice asking questions about the event and offering suggestions about how to manage the patient postoperatively in the intensive care unit. This experience piqued my interest in learning more about MH and the Malignant Hyperthermia Association of the United States.

Years later, my second experience with malignant hyperthermia became personal. It occurred in my own patient. However, it did not occur as I imagined. There was no immediate temperature rise, increase in end tidal carbon dioxide or muscle rigidity. The clinical manifestations occurred late and gradually during the case. The early recognition and treatment of the malignant hyperthermia event reflected my previous encounter with MH and my discussion with the MH Hotline Consultant.

Most of the MH Hotline Consultants have had similar experiences which developed their interest in malignant hyperthermia and committed them to become active in educating the public and their peers through speaking engagements, publications and research. Many have been in anesthesia practice for 10, 15, or 20 years. The consultants are members of The Malignant Hyperthermia Association of the United States which has been in existence since 1981 and led by Dr. Henry Rosenberg.

The MH Hotline was formed in 1982 and the qualifications to become a MH Hotline Consultant are straightforward. The individual must be a board certified anesthesiologist in active practice and have a strong interest in the field of malignant hyperthermia, as evidenced by the study or care of patients affected by MH or publishing information related to MH. Also, the individual must be willing to take call at least once a year in two week increments, during which they are available 24/7. Most importantly, the individual must be recognized for their work and have been recommended by a MH Hotline Consultant, who then serves as that person's mentor.

I was fortunate to have Dr. Barbara Brandom, Director of the North American MH Registry of MHAUS, as my mentor, along with Dr. Andrew Herlich, Chairman, Department of Anesthesiology UPMC Mercy and Dr. Richard Kaplan, Division Chief, Anesthesiology and Pain Medicine, Children's National Medical Center, as supporters. Dr. Brandom would be my consultant during my first two weeks on call answering calls routed through the Poison Control Center at Upstate Medical Center in Syracuse, New York. During this time, I received some of the best advice from Dr. Brandom, " Tae, just remember to be calm, and don't overlook the obvious."

Most calls are nonemergent/urgent in nature, such as deciding whether a patient with a certain type of myopathy should be treated as MH susceptible. Other times, I have been asked to consult on a postoperative patient in the SICU being acutely managed for suspected MH. The timing of calls can be interesting. I have accepted calls not realizing I am approaching a parking garage, which required me to stop so I would not lose my cellular signal. Another time, while answering an MH call in the OR hallway, I got a stat page by my resident to the operating room.

After each call, the consultant is required to fill out a questionnaire regarding the patient and the event and the likelihood the patient experienced a true MH episode. These questionnaires are electronically filled and forwarded to a quality improvement committee. The committee then reviews randomly selected cases to see how the cases were managed. A summary is provided to the consultants to review, discuss and improve the way calls are handled.

So, what is it like to be a MH Hotline Consultant? It is a great experience and opportunity, which allows you to interact with your fellow peers and help manage a rare and lethal disease unique to the field of anesthesia.

The place of premedication in pediatric practice: Pro-Con Debate. Moderator: A R Wolf. Pro: Premedication is a necessary part of pediatric anesthesia. Rosenbaum A and Kain ZV. Con: Premedication in Pediatric anesthesia should be individualized and the choice of pharmacological agent should be reconsidered

Larsson P and Lönnqvist P-A. *Pediatric Anesthesia* 2009; 19:817-828.

Submitted by Hoshang J. Khambatta, MD

The subject of premedication for children undergoing anesthesia remains of concern to the anesthesiologist. The journal *Pediatric Anesthesia* has published an interesting debate on this subject which I will try to summarize.

Dr. Khambatta

Rosenbaum and Kain (R&K) called for an evidenced-based approach in preparing children for surgery. They estimated that about 70% of all children exhibit significant stress and anxiety sometime prior to surgery. Some reasons for this discomfort were suggested to be the child's perception of bodily harm and discomfort, threat of separation from parents and apprehension about the unknown.

Extreme anxiety and stress has been associated with postoperative emergence delirium in up to 18% of the children with maladaptive behavior such as nighttime crying, enuresis, separation anxiety, apathy, withdrawal, and temper tantrums. Preoperative anxiety activates stress responses with increased levels of steroids and susceptibility to postoperative infections. R&K, having established that preoperative anxiety is associated with adverse outcome, then consider what can be done to reduce this potentially deleterious behavioral response, suggesting three possible approaches namely, behavior preparation programs, parental presence during induction of anesthesia, and sedative premedication.

On the surface behavior preparation programs appear to be a simple concept, i.e., tell the child and parent what is going to happen. However, in reality it is not so simple. What, how, when, and who provides this information are all important factors to consider. Helping the child develop coping skills has been shown to be most effective preparation.

Other approaches in order of effectiveness include modeling, play therapy, operating room tour, and printed material the least effective. It is not surprising that most children's hospitals employ the less costly and least effective techniques of providing printed information and guided tours. Recent studies have shown that cognitive preparation methods are as effective in reducing presurgical anxiety as midazolam sedation. The authors then ask the most pertinent question, why is the least effective method employed the most often? They suggest that the culprit is most likely to be time and cost – no surprise here. Both parents and child need to be present for a preoperative visit, and need to be counseled by a psychologist or a nurse with a behavioral background. Although there have been earlier observational reports, evidence to date does not support the routine use of parental presence to reduce preoperative anxiety. The authors feel that if the parents wish, they have a right to be present when their child undergoes anesthesia. Hence, parents are allowed to be present during induction of anesthesia to relieve their own anxiety rather then the child's.

The sedatives most commonly used for premedication by the authors (R&K) are oral midazolam and clonidine. Multiple randomized controlled studies have shown that midazolam is far superior to either preparation programs or parental presence in terms of preoperative anxiety or compliance during induction of anesthesia. They also noted that parental presence had no additive anxiolytic effect for those children who received oral midazolam.

Nevertheless parents of these children were less anxious and more satisfied with the separation process and the induction of anesthesia. Parental satisfaction and their impression of the anesthesiologist are heavily dependant on the separation phase. A crying, upset child can leave parents with a feeling of dissatisfaction with the anesthesia process.

Midazolam is a short acting benzodiazepine that is very lipophilic, and hence produces rapid onset of sedation. It induces satisfactory sedation, antigrade amnesia and anxiolysis within 20 min with an oral dose as low as 0.25 mg/kg. It also comes in a variety of tastes and as such is highly acceptable by the children. Furthermore it also improves the post operative outcome of behavioral changes. Clonidine has significant sedative and analgesic properties because of its alpha-2 adrenergic agonism. It produces effective perioperative sedation and anxiolysis, acts as an analgesic, decreases volatile anesthetic requirements, and improves hemodynamic stability. It can be administered orally, 4 mcg/kg or intranasally, 2 mcg/kg. Its major drawback is prolonged onset time and therefore has to be administered 45 min before induction. It does not produce antegrade amnesia hence does not affect postoperative behavioral changes but is beneficial when postoperative analgesia is needed. The most viable option in economic terms is midazolam.

Nonpharmacological interventions such as child preparation programs and parental presence do not appear to be as cost effective. Further work in the area may improve their efficacy. In summary, R&K emphasize the need to treat preoperative anxiety in children.

Larsson and Lönnqvist (L&L) state that the reasons for which routine premedication was used in the past are now obsolete, hence they argue against its routine use. They believe that in those children where such treatment is still judged necessary, the use of midazolam is a poor choice. To reduce preoperative stress and anxiety L&L suggest that the hospitals develop a more child friendly environment with age specific preparation for both child and parents. They recommend the use of multimodal information packages that include mandatory preoperative information given by an anesthesiologist or a nurse anesthetist, information brochures, preoperative guided tours of the operating room, play rooms with anesthetic equipment, and web-based age specific information systems. They also recommend the use of clowns to be present at

Continued on page 14

anesthesia induction and for preoperative play therapy.

Although there are reports questioning the usefulness of the perioperative information package it is the opinion of the authors that the value of the information presented is highly dependant on its format. Hence it is important to have different types of information available in different formats for different circumstances.

The authors also consider the advantages and disadvantages of parental presence during induction but concluded that it is the norm in their practice. L&L argue against the routine use of anticholinergic drugs, because with the advent of modern anesthetics they have become redundant. They recommend that children under a year of age who may exhibit a vagal respose may receive an anticholinergic drug as needed. They question the routine use of midazolam as a premedication, claiming that we are creatures of habit, brought up with its routine use and have not questioned its continuing value. Then they put forward a more unpalatable rationale, namely the lack of multimodal information package. They recommend such an approach and furthermore state that in their view preoperative sedation is driven by discomfort felt by the anesthesiologist and the surgical team having to deal with the complexities of managing the child who is unprepared and unexpectedly reluctant to be part of the induction process. L&L believe that midazolam is a poor choice and instead suggest that clonidine is a better alternative. Clonidine takes 45 minutes for the onset of its effectiveness and does have post operative analgesia which can be beneficial. The child also remains sedated for a longer period of time and does not have to be street fit to be discharged home while accompanied by a care giver. The newer super-selective alpha-2 adrenoreceptor agonist dexmedetomidine is even a better alternative. The authors practice what they preach. They have obligatory preoperative assessment by an anesthesiologist, a web-based age-specific information system, preoperative information brochures, on-demand hospital clown services, and a long standing tradition of parental presence at induction. They have given up the use of midazolam completely and use mainly alpha-2 adrenoreceptor agonists.

Questions and Answers: Following the debate there was a questions and answers session.

1st questioner referred to psychological preparation working better in countries other than United States. R&K suggested that it is a matter of sensitivity to the distress of children and a willingness to accept it. In the United States there is a high level of sensitivity to any crying child, but this might not be the case in other cultures. Besides there are no studies evaluating good preoperative demeanor and the role of inherent biases. L&L suggested that European parents are used to generous maternity leave as compared to American parents. Hence American parents are used to leaving their children in the care of others and so do not insist on accompanying them to the operating room.

2nd questioner suggested that premedication is used to hide deficiencies in preparing the child. R&K suggested that there were no studies to refute or confirm the conjecture. However, they recommend that if the child is coping well there is no need to administer midazolam. They added that in medicine there is never "always" and never "never." L&L agreed that the problem may be with the anesthesiologist.

3rd questioner inquired if there are any guidelines as to which child will be comfortable with or without premedication. R&K agreed that the anesthesiologist must know how to cope with the child and the parents. Unfortunately they are not taught this in medical school. L&L emphasized that a prior visit by the anesthesiologist is very important.

4th questioner asked what if the child that is sufficiently upset and refuses premedication? R&K suggested intra-muscular or rectal approach if the parents agree. Rescheduling is not an option in the US because of economic concerns. L&L recommend rescheduling and next time round give a long acting premedication in a little apple juice two hours prior to intervention.

5th questioner. Neonates do not have separation anxiety, what about parental presence for these cases? At what age parental presence and premedication become significant. R&K opined that separation anxiety does not develop before age of 8-12 months. If you are looking to make parents happy you can consider premedication and parental presence at any age. L&L opined that they do not allow parents in the operating room for neonates but allow parents for children under 3 months age. Pharmacological premedication is not needed before 3-6 months age.

Comments: In my English class at school our teacher would come up with idioms. The one that has stuck in my memory is "cut your coat according to your cloth." I think that the multimodal approach that L&L propose is unlikely to fly in the United States. Most American parents do not have the luxury of paid leave that our European counterparts enjoy. Hospitals do not have the resources for a new labor intensive program. When one group shouts about "pulling the plug on grandma" it would indeed be preposterous to ask for resources for clowns in the operating room. In the US system it would certainly be very difficult for an anesthesiologist to visit the child and parents days before surgery. By the same token there is no excuse for not seeing child and parents before entering the operating room. I personally try to spend as much time as necessary to answer all questions, allay fears and gain the confidence of both the child and parents. I do not think that premedication should be given to all children as a routine. Judgment is required after discussion with the child and parents. If they are happy sans premedication, so am I. My premedication of choice remains midazolam as I do not have the luxury to wait for 45 minutes for clonidine to take effect. Regarding parental presence, the choice is theirs. I have no fixed rules. Every now and then I come across a teenager who requests that his parents not join him in the operating room. If this is the consensus of the family we respect their wishes. As per L&L, I have no immediate plans to make my practice free of midazolam. It was interesting to note that after L&L speaking so highly about a multimodal approach a little less than 50% of their patients still required pharmacological support. In the final analysis we should treat each child as an individual with a tailored approach.

PEDS PASSPORT Your global meeting itinerary

2010

Helen V. Lauro, MD, FAAP
Long Island College Hospital,
Brooklyn, NY

February 10-14: Lake Buena Vista, Florida, USA
13th Annual Update on Pediatric Cardiovascular Disease Bringing Interdisciplinary Evidence-Based Practice to the Patient
Tel: 1-215-590-5CME, Fax: 1-215-590-4342
Information: Continuing Medical Education Department, The Children's Hospital of Philadelphia, 34th Street and Civic Center Boulevard, Philadelphia, PA 19104-4399
www.chop.edu/cardiology2010/pdf/cardio2010.pdf

February 21-25: Keystone, Colorado, USA
The 26th Annual Children's National Medical Center Symposium: ECMO & the Advanced Therapies for Respiratory Failure
Fax: (202)-476-3459
Information: Department of Neonatology Children's National Medical Center 111 Michigan Ave. N.W. Washington, DC, USA 20010
http://www.ecmomeeting.com/

April 28-May 1: Montreux, Switzerland
10th European Conference on Pediatric and Neonatal Ventilation
Tel: + 41 22 906 9178 Fax: + 41 22 732 2850
Information: ESPNIC Administrative Office, c/o Kenes International, 1-e Rue de Chantepoulet, P.O. Box 1726, CH- 1211 Geneva 1, Switzerland
www.espnic.de

March 7-11: Acapulco, Mexico
Eighth International Symposium on Pediatric Pain (rescheduled event)
Tel (604)-681-2153, Fax: (604)-681-1049
Information: International Conference Services Ltd., Suite 2101 – 1177 West Hastings Street, Vancouver, BC Canada V6E 2K3
www.meet-ics.com/ispp2009mexico/

March 18-21: Memphis, Tennessee, USA
Anesthesia Update: Emphasis on Pediatrics
Tel: (800)-222-6927
Information: Northwest American Seminars, P.O. Box 2797, Pasco, WA 99302
www.nwas.com/memphis/10mtn.html

April 15-18: San Antonio, Texas, USA
Society for Pediatric Anesthesia (SPA)/American Academy of Pediatrics (AAP) 2010 Winter Meeting
Tel: (804)-282-9780, Fax (804)-282-0090
Information: Society for Pediatric Anesthesia, 2209 Dickens Rd, Richmond, VA 23230-2005
www.pedsanesthesia.org

April 17-18: San Antonio, Texas, USA
Fundamentals of Pediatric Anesthesiology
Tel: (804)-282-9780, Fax (804)-282-0090
Information: Society for Pediatric Anesthesia, 2209 Dickens Rd, Richmond, VA 23230-2005
www.pedsanesthesia.org

May 23-26, Louisville, Kentucky, USA
5th International Multidisciplinary Society for Pediatric Sedation Conference
Tel: (804) 565-6354, Fax: (804) 282-0090
Information: Society for Pediatric Sedation, 2209 Dickens Road, Richmond, VA 23230-2005
www.pedsedation.org

May 26-28: Boston, Massachusetts, USA
Fourth Annual Pediatric Anesthesiology and Critical Care Medicine Conference: Perioperative Care of the Infant and Child
Jointly Sponsored by Children's Hospital Boston, the Children's Hospital of Philadelphia and Harvard Medical School
Tel: (617)-355-8253, Fax (617)-730-0894
Information: Carol Vey, Department of Anesthesiology, Children's Hospital Boston, 300 Longwood Avenue, Boston, MA 02115
http://cme.med.harvard.edu/

June 4-6: Aurora, Colorado, USA
International Symposium on the Pediatric Airway (ISPA)
Program Directors: Larry Borland, MD, FAAP, David Polaner, MD, FAAP, Geoffrey Lane, MBBS
Tel: (303)-724-1977, Fax: (303)-724-1761
Information: Beverly.Janik@ucdenver.edu
Website: Pending

June 17-19: Saarbrücken, Germany
36th Annual Meeting Gesellschaft für Neonatologie & Pädiatrische Intensivmedizin - GNPI 2010
Tel: +49(0) 621 / 4106-137, Fax: +49 (0) 621 / 4106-80 13 7
Information: Daniela Ruckriegel, Rosengarten Platz 2, 68161 Mannheim
www.gnpi2010.de/default.htm

Please forward all information concerning congresses relevant to Pediatric Anesthesia to:
Helen V. Lauro, MD, MPH, FAAP, Department of Anesthesiology, Long Island College Hospital, 339 Hicks Street, Brooklyn, New York 11201.

September 1-3: Columbus, Ohio, USA
International Symposium on the Hybrid Approach to Congenital Heart Disease
Tel: (614)-722-2000
Information: Nationwide Children's Hospital, 700 Children's Drive, Columbus, Ohio 43205
www.hybridsymposium.com

September 2-4: Berlin, Germany
2nd Congress of the European Society for Paediatric Anaesthesiology
Tel. +49-30-9401-53200, Fax +49-30-9401-53209
Information: Prof. Jochen Strauß, Klinik für Anästhesie, Perioperative Medizin und Schmerztherapie Helios-Klinikum Berlin-Buch, Schwanebecker Chaussee 50, D- 13125 Berlin
www.feapa.eu/congress-calendar/Berlin

September 2-5: Queenstown, New Zealand
Society for Paediatric Anaesthesia in New Zealand and Australia (SPANZA) Combined Meeting with Asian Society of Paediatric Anaesthesiologists (ASPA)
Tel: +61 2 4973 6573, Fax: +61 2 4973 6609
Information: SPANZA Secretariat, P.O. Box 180, Morriset, New South Wales, Australia 2264
www.spanza.org.au

September 16-17: Manchester, United Kingdom
Paediatric Intensive Care Society (PICS) Annual Conference 2010
Telephone: +44 (0) 1403 711301, Fax: +44 (0) 1403 710058
Information: Tarquin Scadding-Hunt , Maximize Events Ltd, Virginia House, High Street, Partridge Green, West Sussex RH13 8HX
www.ukpics.org

September 24th-26th: Seattle, WA, USA
Regional Anesthesia in Children
Seattle Children's Hospital
Contact: kathie.kohorn@seattlechildrens.org
www.seattlechildrens.org/healthcare-professionals/education/cme/calendar/#anesthesia

October 2-5: Copenhagen, Denmark
21th European Society of Paediatric and Neonatal Intensive Care (ESPNIC) Medical and Nursing Annual Congress at the European Academy of Paediatrics
Tel: + 41 22 906 9178 Fax: + 41 22 732 2850
Information: ESPNIC Administrative Office, c/o Kenes International, 1-e Rue de Chantepoulet,
P/O/ Box 1726, CH- 1211 Geneva 1, Switzerland
www.espnic.de

October 15: San Diego, California, USA
Society for Pediatric Anesthesia (SPA)/Society for Paediatric Anaesthesia in New Zealand and Australia (SPANZA) Joint Meeting
Tel: (804)-282-9780, Fax (804)-282-0090
Information: Society for Pediatric Anesthesia, 2209 Dickens Rd., Richmond, VA 23230-2005
www.pedsanesthesia.org

October 23-26: Copenhagen, Denmark
The 3rd Congress of the European Academy of Paediatric Societies
Tel: +41 22 908 0488, Fax: +41 22 906 9140
Information: Registration and Accommodation Department, Kenes International, 1-3 Rue de Chantepoulet, PO Box 1726 , CH- 1211, Geneva 1, Switzerland
www.kenes.com/paediatrics

December 7-10: Miami Beach, Florida, USA
The Pediatric Cardiac Intensive Care Society 8th International Conference
Tel: (866)-904-2048
Information: DRIVE Medical Consulting & Communications, Miami Beach, Florida
www.pcics.org/meeting_info.php

December 9-12: Los Angeles, California, USA
Fourth Annual Pediatric Anesthesia Update
Tel: (800)-222-6927
Information: Northwest American Seminars, P.O. Box 2797, Pasco, WA 99302
www.nwas.com

2011

March 13-17: Sydney, Australia
6th World Congress on Pediatric Critical Care
Tel: +61 292650700, Fax: +61 292675443
Information: 6th World Congress on Pediatric Critical Care Congress Organizers, GPO Box 128, Sydney, NSW 1001, Australia
www.pcc2011.com

March 30-April 3: San Diego, California, USA
Society for Pediatric Anesthesia (SPA)/American Academy of Pediatrics (AAP) 2011 Winter Meeting
Tel: (804)-282-9780, Fax (804)-282-0090
Information: Society for Pediatric Anesthesia, 2209 Dickens Road, Richmond, VA 23230-2005
www.pedsanesthesia.org

June: Hannover, Germany
22nd European Society of Paediatric and Neonatal Intensive Care (ESPNIC) Medical and Nursing Annual Congress
Tel: + 41 22 906 9178, Fax: + 41 22 732 2850
Information: ESPNIC Administrative Office, c/o Kenes International, 1-e Rue de Chantepoulet,
P/O/ Box 1726, CH- 1211 Geneva 1, Switzerland
www.espnic.de

October 14: Chicago, Illinois, USA
Society for Pediatric Anesthesia (SPA) 25th Annual Meeting
Tel: (804)-282-9780, Fax (804)-282-0090
Information: Society for Pediatric Anesthesia, 2209 Dickens Road, Richmond, VA 23230-2005
www.pedsanesthesia.org

2012

October 10-12: Washington, D.C., USA
International Assembly of Pediatric Anesthesia
Tel: (804)-282-9780, Fax (804)-282-0090
Information: Society for Pediatric Anesthesia, 2209 Dickens Road, Richmond, VA 23230-2005
www.pedsanesthesia.org

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Portex Uncuffed Pediatric-Sized Tracheal Tubes: Nationwide recall due to risk of obstruction and inability to ventilate patient

Audience: Anesthesiology healthcare professionals, hospital risk managers

Smiths Medical and FDA notified healthcare professionals about a nationwide voluntary recall of Portex Uncuffed Pediatric-Sized Tracheal Tubes (sizes 2.5, 3.0 and 3.5 mm). A small number of tubes were manufactured with internal diameters slightly smaller than indicated on the labeling, which may create the potential for the clinician to experience difficulty passing through or withdrawing the suction catheter. The health consequences that may result from use of the defective device include the inability to remove secretions from the device and from the patient's airway, which may result in partial or complete obstruction of the airway and an inability to ventilate the patient. In addition, this defect may increase airway resistance and compromise the ability to ventilate the patient. There is a reasonable probability of serious injury and/or death.

Smiths Medical is instructing customers to return all unused Tracheal Tubes and in their press release has provided recommendations for management of recalled product that is currently in use.

Read the complete MedWatch Safety summary, including a link to the firm's press release, at:

http://www.fda.gov/Safety/MedWatch/SafetyInformation/SafetyAlertsforHumanMedicalProducts/ucm182084.htm