

Society for Pediatric Anesthesia



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Volume 17 Number 1

Winter 2004

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Anne M. Lynn, MD, SPA President with Yasuhiro Shimada, MD, PhD, FCCP, JSPA Past President



Meeting registrants and guests attending the evening reception at the San Francisco Museum of Modern Art were treated to a private viewing including the works of Marc Chagall and a musical performance by Fabio Mastrangelo, a pianist from Italy and Sergei Slovachevsky, a cellist from St. Petersburg, Russia.

Find it on the Web

www.pedsanesthesia.org

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Society for Pediatric Anesthesia



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Editor's Corner



Rita Agarwal, MD, FAAP

WOW, what a great meeting and what an incredible newsletter we have this time. The bulk of this issue (both the printed newsletter and the web-based newsletter) is dedicated to a review of the SPA/JSPA meeting (thanks to **Dr. Helen Lauro**) and the ASA meeting in October (thanks to **Drs. Valerie Armstead, Anne Dickison, Ronald Litman, Thomas Mancuso, and Allison Ross**). **Dr. Rebecca Dalmeida** was gracious enough to share photographs taken from the meetings and in and around San Francisco

There are also our usual excellent selection of article reviews (thanks, **Drs. Sam Golden, Constance Moniotti, Helen Lauro and Cheryl Gooden**) and an intriguing Fellows Corner by **Dr. Joseph Tobin** with a commentary by **Dr. Jeffrey Galinkin**. The Fellows Corner this issue focuses on non-ACGME accredited fellowships. We're hoping to stir controversy and induce some feedback.

I also wanted to highlight the minutes from the Governmental Affairs Committee Meeting (in the Web News). If you're like me, when you hear the phrase "governmental affairs" your head starts to nod, however the SPA's committee is involved with some very exciting developments that have the potential to have a real impact on the way many anesthesiologists practice pediatric anesthesia. **Dr. Mark Singleton** is the Chair of that Committee and has done a very nice job summarizing the issues discussed at the meeting as well as future goals. **Dr. Patricia Davidson** has done the same for the American Academy of Pediatrics: Section of Anesthesia and Pain Management. She briefly describes the past activities of the section and upcoming events planned for the combined SPA/AAP Meeting in Phoenix in March.

Finally I wanted to let everyone know about some exciting new features that will be appearing soon on the website (www.pedsanesthesia.org). We are going to start offering a Problem Based Learning Discussion (PBLD) in January. The first PBLD is based on the most popular PBLD from the 2002 SPA/AAP Meeting and will be on caring for a patient who has had a Fontan Procedure and needs to have a spine fusion by Dr. Steve Stayer. I hope everyone will read this new feature and send me any suggestions for changes, future topics (and writers) and comments. Dr. S. Suresh has also agreed to contribute to Peripheral Nerve Block Section on the website. As always, I welcome any contributions, comments, and suggestions.

Have a great new year and I hope to see everyone in Phoenix.



Members of the Communications Committee meet to review topics for upcoming newsletters and to divide up coverage of ASA lectures of interest to Pediatric Anesthesiologists.

President's Message

I feel obliged to begin this message with my thanks – to Mark Rockoff, Katsuyuki Miyasaka and all the staff at Ruggles for their incredible efforts and dedication to the October meeting.

The first international joint meeting of the SPA and Japanese SPA was a huge success. The meeting speakers were excellent and the translators did an amazing job of simultaneous translation. My mind boggles at the thought of translating the science presented as the speaker presented. Over 500 anesthesiologists attended, with some 60 Japanese members who traveled great distances from Japan. For the first time at this meeting, posters were displayed including both scientific topics and 40 describing major pediatric anesthesia programs/hospitals in North America and Japan. The afternoon session finished with an amazing lecture on the Nobel Prize and early and recent award recipients in medicine/physiology by Dr. Sten Lindahl, who recently chaired the Nobel Committee in Medicine/Physiology. It was the perfect endnote to our international meeting. The evening reception at the Museum of Modern Art was also a rousing success with more than 600 attendees. We had great food and company (as we always do), but also were able to view the Chagall exhibit there. Dr. Miyasaka arranged a wonderful concert during the evening given by a Russian cellist and Italian pianist. There was something to please every sense! The success of this meeting and all the work many did to increase funding support means that the expenses for the meeting will not be causing substantial depletion of reserves. My thanks also go to our corporate sponsors who were so generous. So, scientifically, socially and fiscally, we all won.

The Winter Meeting program, which will take place in Phoenix, has been finalized by Lynne Maxwell and the Education Committee. The meeting will begin with a session on patient safety and responses to unanticipated events, including managing personal, legal and sentinel event processes. The afternoon sessions will be clinical, with anesthesia and pediatric diseases being followed by Jeopardy. Saturday morning will start with PBLDs, then the SPA and AAP Anesthesia and Pain Management awards and oral abstract presentations and the AAP Advocacy lecture followed by walk-around poster discussions. Workshops and refresher courses will be presented with new topics and return of those well received at past meetings. The final morning will include a panel presentation on international medical services, talks on anesthetics as neuroprotectants or neurotoxins, and the morning will end with a presentation on the pediatric peri-operative experience: should hospitals have performance based credentialing (the California experience). Dr. Maxwell has also arranged a PALS workshop for the Thursday preceding the meeting for a limited number of registrants, which, in combination with some of the meeting

lectures, will allow PALS certification. So, mark your calendars now for March 4-7, 2004. We're counting on Arizona weather to be sunny and warm.

I want to invite those members new to SPA, who have an interest, to participate in one of the Committees. Participation on committees is the best way to become active in the organization. Most of the Board of Directors are selected by the Nominating Committee based on their active participation. The committee structure was set up in 1987 to limit membership to a maximum of 6 years (three 2 year terms) in order to encourage "new blood". There are many committees, so one should fall in an interest area of yours: communications, education, finance, membership, research, governmental affairs, bylaws, and ad-hoc international education and service. Some are large and some have few members but all welcome new or junior recruits. Send an e-mail to the SPA office or to me and I'll put you in touch with the committee chair.

Finally, I want to let the membership know what SPA is planning to help those anesthesiologists who have time-limited certification (graduates after 2000) in Anesthesiology. The Board believes it is our responsibility to develop education materials that will be useful in completing pediatric portions of the portfolio for Life-long Learning that the ABA is developing. This will constitute a major undertaking, but we feel it is a responsibility we should and will fulfill. I'll update you as this goes forward.

My best wishes for a healthy winter season to you all.

Anne M. Lynn, MD
SPA President



Anne M. Lynn, MD

Joint meeting of the Society for Pediatric Anesthesia and the Japanese Society of Pediatric Anesthesiology

San Francisco, California • October 10, 2003

Reviewed by



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The first joint meeting of the Society for Pediatric Anesthesia (SPA) was held with its counterpart from Japan, the Japanese Society of Pediatric Anesthesiology (JSPA) on October 12 at the St. Francis Hotel in San Francisco, CA. The meeting was well attended and simultaneous translation was provided both English and Japanese attendees. Program Chairs, **Mark A. Rockoff, MD** (Children's Hospital, Boston) and **Yasuhiro Shimada, MD, PhD, FCCP** (Nagoya University School of Medicine, Nagoya, Japan) provided welcoming remarks.

The morning session "*Innovative Approaches to the Surgical Neonate*" moderated by **Anne M. Lynn, MD** (Children's Hospital and Regional Medical Center, Seattle), **Michael Harrison, MD** (University of California, San Francisco) lectured on the surgical perspective of fetal surgery. Fetendo techniques (minimally invasive techniques for fetal intervention) have revolutionized fetal surgery in the last 10-12 years. He discussed a myriad of conditions including hydrocephalus, congenital cystic adenoid malformation (CCAM) of the lung, sacrococcygeal teratoma (SCT), congenital heart block, twin-twin transfusion syndrome (TTTS), where treatment has been attempted, and incorporated a "Fetal Surgery Report Card" to depict grades for understanding of disease, patient selection and treatment options (either open or fetoscopic). He mentioned that while fetal surgery did not change neonatal outcome for some conditions like congenial diaphragmatic hernia (CDH), endoscopic laser ablation of vessels and amnioreduction has been very effective in TTTS. Of special note, he discussed the ex-utero intrapartum treatment procedure (EXIT), in which children with



anticipated airway problems are dealt with by the fetus being half delivered, leaving a connection to the placenta to allow up to several hours of time without an airway emergency to intubate and perform corrective surgery, rather than traditional postnatal correction. Dr. Harrison concluded that fetal surgery was the best way to go for radiofrequency ablation for TTTS (90% success), CCAM resection, SCT, but offered no advantage with some conditions like myelomeningocele. **Laura Myers, MD** (Children's Hospital, Boston) discussed the anesthesia perspective of fetal surgery. She opened her talk with evidence to support the presence of fetal pain and need for anesthesia. This was measured by a stress response during fetal development, resulting in increased cytokines that speed uterine maturation and increase risk for preterm labor. Noxious stimuli can trigger release of norepinephrine at 18 weeks, and at 20 weeks slower cortisol and beta-endorphin responses. Touch and pain sensation develop first in the fetus, with nociception around the mouth as early as seven weeks, and the development and synapsing of peripheral afferent nerves in the spinal cord between 10-30 weeks. Importantly, she stated that the receptive field is larger in utero, and that various stimuli might induce an exaggerated response in the fetus. Of the four routes of fetal anesthesia, intravenous/intramuscular/transplacental/intraamniotic, the intra-amniotic route offers rapid uptake by the fetus, with minimal entry into the maternal circulation. Real time video footage illustrating fetal resuscitation via drug and blood administration was shown. A final video of the management of a 30-week fetus with polyhydramnios, an oropharyngeal teratoma extending to the mediastinum with airway compromise, and scalp and trunk edema was shown. The EXIT procedure was shown allowing delivery of the head and neck, an ultrasound probe to monitor fetal function and identify tracheal rings and surgical tracheotomy in an unpressured and safe time frame. **Shoichi Uezono, MD** (Tokyo Women's Medical University, Japan) discussed the Japanese approach to CDH. Low perinatal and infant mortality is attributed to the Japanese social background including good prenatal education, low



teenage pregnancy and strong familial support. In addition he also attributed this low rate to strengths of their medical system including perinatal/neonatal care centers and regionalization and advances of medical management such as high-frequency oscillatory ventilation (HFOV). His group has attempted transplacental anesthesia to deliver an antenatally diagnosed CDH baby depressed enough to allow intubation without breathing or swallowing effort. Then HFOV is exclusively utilized on admission to the NICU, and the neonate is stabilized prior to delayed surgery. In their small study of 12 patients from 1996-2001 undergoing CDH repair, their management achieved a 90% survival rate, without the use of ECMO therapy. All of the CDH survivors were free from pulmonary complications. Limitations included small study size, higher maternal and neonatal risks such as inability to intubate, and lack of ECMO as rescue therapy.

Etsuro Motoyama, MD (Children's Hospital of Pittsburgh) moderated the second session "*The Upper Airway in Pediatric Anesthesia*", and opened with a discussion of maintenance of upper airway patency in children. The effects of anesthesia on airway patency were contrasted with the pathogenesis of upper airway obstruction (UAO) during sleep in obstructive sleep apnea (OSA). He concluded his

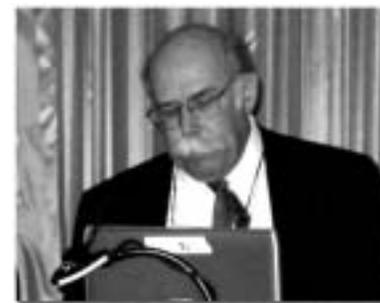


talk with the measures that the anesthesiologist can utilize to prevent UAO under general anesthesia. Of note, chin lift with jaw thrust with CPAP offer the best upper airway patency. **Shiroh**



Isono, MD (Chiba University, Japan) discussed the physiology of the upper airway. He opened his talk with an overview of the multiple functions of the pharynx including swallowing, vocalization, and the facilitation of breathing by anatomical and neural mechanisms, which interact to adjust lumen size and stiffness. Methods of airway maintenance during breathing were described with a "meat and container model" –the "meat" being the soft tissue, muscle, and fat, and the "container" being the bony support. Some examples were used to illustrate—with obesity, macroglossia, Prader-Wili syndrome, airway patency decreases due to increases in size of pharynx (meat); with small maxilla, mandible, Pierre-Robin syndrome, airway patency decreases due to decreases in the size of the container (meat unchanged). Measures to counter same include advancement of the mandible and extension of the neck to improve airway patency.

He stressed the sequential interaction between anatomical and neural factors that occurs upon loss of consciousness, to facilitate airway patency and contrasted these mechanisms in neonates, children and adults. Neonates rely on reflexes and chemical responses to maintain airway patency during sleep. This has important implications because anesthesia probably depresses neural mechanisms which may affect infant postoperatively. Children have greater anatomical stability (smaller head, larger jaw, increased container) with a higher closing pressure between age 1-13 years, with diminished risk of airway obstruction. Adults have a higher body mass index compared to children which decreases airway patency, and rely more on arousal for maintenance of upper airway. The final lecture of the morning by **Thomas G. Keens, MD** (Children's Hospital, Los Angeles) explored



sleep apnea in infants and children. The cortex influences behavioral control of breathing and the brainstem affects chest wall movement via chemoreceptors. In REM sleep, the cortex controls breathing; during quiet sleep, breathing is controlled by brainstem, and regularly timed. The causes of obstructive sleep apnea were elaborated- (the most important being a small upper airway), as well as symptoms, diagnosis (gold standard-polysomnography) and treatment. OSA is common in infants, and is largely obstructive not central. Older children usually have obstructive apnea secondary to tonsils/adenoids. Treatment is required when problems with gas exchange are manifest such as hypoxia or hypercarbia.

Robert Crone, MD (Harvard Medical School, Boston) moderated the afternoon session "*Medical and Anesthesia Care in Japan and the U.S.A.*". **John Takayama, MD, MPH** (National Center for Child Health and Development, Tokyo, Japan) contrasted the problems and differences between the respective health care systems, health insurance, organization of health care, education of physicians, physicians and facilities, health status, causes of death and health care options. While 99% of the Japanese population has mandatory national health insurance, health outcomes are negatively impacted by unfavorable changes in policy issues such as immunization, where the childhood immunization rate against measles is 10% lower than the U.S.A., and last year there were 100,000 cases with 100 deaths. Health care is more intervention- based than prevention-based. Unintentional injury has a high incidence in Japan with drowning occurring secondary to deeper tubs (versus pools in U.S.A.), and motor vehicle accidents –most children do not wear bicycle helmets, and many automobile passengers do not use seat belts.

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Yasuhiro Shimada, MD, PhD (Nagoya University, Japan) focused on the Japanese point of view on controversial issue in pediatric anesthesia training and practice. He first opened with the history of the JSPA started by Seizo Iwai in 1971 to provide a forum exchanging information on pediatric anesthesia. He then described data collected from questionnaires to 106 university hospitals (UH) and 17 children's hospitals (CH). While both hospital types perform equal numbers of pediatric cases, training opportunities vary—two-thirds of UH don't have specialty training, whereas at CH the average training period is nine months. Currently there are not enough pediatric anesthesiologist positions. In Japan, of the 17 CH only 78 staff positions and 34 resident positions exist. The future goal is that CH become pediatric anesthesia training centers and academic leaders as their U.S. counterparts. The questions of subspecialty certification of pediatric anesthesia is open—in another questionnaire provided to the council members of the Japanese Society of Anesthesiologists (JSA) 60% responded pediatric anesthesia a not a subspecialty of anesthesia. However, 69% responded experience in pediatric anesthesia should be mandatory. **Steven C. Hall, MD** (Children's Memorial Hospital, Chicago) concluded the afternoon session with the U.S.A. point of view on controversies in pediatric anesthesia training and practice. He discussed six contentious areas. In particular, these included (1) which hospitals should handle high risk pediatric cases, (2) what minimum equipment and systems are in place for institutions that care for children, (3) if pediatric anesthesiology is affected by changes in nature of pediatric surgery, (4) how to guarantee that children get the care they need, (5) who should provide anesthesia to pediatric patients, (6) what is next priority for the specialty in the country and who will do it. He concluded that the question of subspecialty certification is pending.

The final lecture of the day was provided by our guest lecturer, **Sten Lindahl, MD, PhD, FRCA** (Karolinska Hospital and Institute, Stockholm, Sweden) the first anesthesiologist to head the Nobel Committee for the Prize in Physiology or Medicine. Dr. Lindahl described the history of the Nobel Prize, starting with a brief biography of Alfred Nobel. Alfred Nobel himself discovered dynamite and held 300 patents in several countries Ironically Mr. Nobel died because he could not conceive how the substance that he used in the creation of dynamite—nitroglycerin could be taken internally to help with his chest pain. He died on December 10th, which is the day that the Nobel Prize is awarded every year. Alfred Nobel specified in his last will and testament that there should be five prizes awarded to "those who have conferred the greatest benefit on mankind" in five areas. These areas are physics, chemistry, physiology or medicine, literature and peace. Dr. Lindahl is currently on the Nobel Committee for the Prize in Physiology and Medicine. The Committee is made up of 15 members chosen from Medical Nobel Assembly; five are regular members and ten are adjunct members. They are responsible for presenting 2-3 final candidates to the Medical Nobel Assembly. The Medical Nobel Assembly is made up of 50 Professors from the Karolinska Hospital and Institute. Dr. Lindahl concluded the lecture by comparing the

first ten prizes awarded in this area with the last ten. He also noted that in the last 50 years the United States has dominated the Awards, but that there are an increasing number of winners from Japan.

The conference was well received by the audience, who look forward to the Joint Winter Meeting of the SPA and AAP Anesthesia Section in Phoenix, AZ.



Out and About the ASA

2003 Annual Meeting, San Francisco, CA

Pediatric Clinical Forum at ASA

Moderated by: Joseph R. Tobin, MD, FAAP, FCCM
Reviewed by: Allison Kinder Ross, MD

This was a well-attended forum under the direction of **Joe Tobin, MD**, Professor of Anesthesiology, Wake Forest University. The panel members were **Rita Agarwal, MD**, Associate Professor of Anesthesiology, University of Colorado and The Children's Hospital, Denver, **Allison Ross, MD**, Clinical Associate Professor of Anesthesiology, Duke University., and **Carlos Archilla, MD**, Staff Anesthesiologist, Arnold Palmer Hospital for Children and Women, Orlando.

Case 1: The first case was of a 7-year old presenting for an emergency appendectomy. His father had an episode consistent with Malignant Hyperthermia (MH) during a previous anesthetic. The child had no previous anesthetics. The panel members and audience were in agreement with using a non-triggering anesthetic technique. There was also general agreement that premedication with dantrolene was not indicated. However there was great discussion regarding the management of intraoperative fever and tachycardia. Suggestions ranged from getting blood gases, treating with dantrolene to simply treating the fever.

Case 2: The second presented case, a 15-month old with trisomy 21 for removal of a coin from the esophagus, was similarly challenging for all. There was great discussion involving the issues of whether preoperative neck films are needed (and if they are, who is going to interpret them), whether an IV is required prior to induction and whether a rapid sequence induction is required. Some institutions and individuals always treat patients with foreign body aspiration as if though they have a full stomach and therefore will use a rapid sequence induction, others do not. The scenario of not being able to start an IV in this child brought further discussions as to alternative techniques of induction. Of more importance was the realization that since these children may be at risk for atlanto-occipital instability and removal of a foreign body can be done either with flexible or rigid esophagoscopy. As child advocates we should promote the use of flexible esophagoscopy whenever it is appropriate.

Case 3: The third case entailed a 43-week ex premature infant, hospitalized with respiratory syncytial virus (RSV) who requires a herniorrhaphy. The discussions centered around, whether the procedure should be postponed (if possible) to allow the resolution of the baby's RSV and/or decrease the anesthetic risk due to his prematurity. Assuming that postponement was not possible the risks and complications of RSV were discussed. As expected, the audience was split between offering a general versus a regional technique. The majority did agree that postoperative monitoring would still be required either way.

Pediatric Panel: Pediatric Pain Management

Moderated by Charles B. Berde, MD, PhD
Reviewed by: Thomas J. Mancuso, MD, FAAP

Panel members **Joseph Tobias, MD; Yuan-Chi Lin, MD, MPH; and Thomas Mancuso, MD** discussed many important areas in the specialty of pediatric anesthesiology.

Dr. Tobias, Professor of Pediatrics and Anesthesiology, University of Missouri, reviewed systemic analgesics in pediatrics. In his talk, "*What's New in Pediatric Analgesics*", he discussed the newer synthetic opioid, remifentanyl, and the published literature on its use in children. Dr. Tobias also reviewed the newer cyclooxygenase-2 inhibitors and the data about safety and efficacy in pediatrics, including the recently released intravenous preparation. The medication dexmetomidine has been studied for some years but has only recently been evaluated in pediatrics and Dr. Tobias reviewed not only that data but some pertinent other studies as well. Based on the presentation of Dr. Tobias, this drug may hold considerable promise for use in pediatrics.

Dr. Lin, Medical Director of Acupuncture, Children's Hospital Boston, presented "*Alternative Modes of Pediatric Analgesia*". Dr. Lin discussed the many alternative and complimentary medicine approaches available to treat pain in children. He reviewed this vast area in a thoughtful and scientific manner as only one so prominent as he in the field could do. Dr. Lin is a strong proponent of complimentary medicine but also a leader in the quest to study these therapies in a scientific manner and his balanced presentation reflected this.

Charles Berde, MD, PhD, Director of the Pain Treatment Service at Children's Hospital, Boston, reviewed regional analgesia in pediatrics. His presentation was remarkably broad and touched all the important new developments in the field without getting immersed minute detail. Dr. Berde discussed the advantages of regional analgesia, the pitfalls with the application of regional techniques in pediatrics and deftly included important scientific underpinnings of the practice in his relatively brief yet complete discussion. His talk brought together the thorough patient understanding of a practicing clinician with the scientific rigor of an investigator.

Thomas Mancuso, MD, Director for the Anesthesia Sedation Service at Children's Hospital, Boston, discussed the provision of sedation and analgesia to children undergoing painful diagnostic and therapeutic procedures. He reviewed this clinical problem from the perspective of a pediatric anesthesiologist. He also discussed the approach that other pediatric specialists have undertaken with this difficult clinical problem and reviewed the role the department of anesthesiology can play in helping the non-anesthesiologist provide the important clinical care to children undergoing these painful procedures.

Controversies in Malignant Hyperthermia, Cases from the MH Hotline

Moderated and reviewed by: Ronald S. Litman, DO

The panel "*Controversies in Malignant Hyperthermia, Cases from the MH Hotline*" featured a number of cases of pediatric anesthesia. Moderated by this author, the panel included Henry Rosenberg, MD, Richard Kaplan, MD, Charles Watson, MD, and Joe Tobin, MD.

Dr. Rosenberg, who was one of the co-founders of MHAUS in 1981 and has been a malignant hyperthermia (MH) hotline consultant for over 20 years, led off the presentation by describing the organization and functions of the Malignant Hyperthermia Association of the United States (MHAUS). The emergency hotline telephone number is 1-800-MH-HYPER (644-9737), and the number for general non-urgent questions and consultations is 1-800-98-MHAUS (986-4287). MHAUS is a not-for-profit organization formed in 1981. Its Board of Directors consists of laypersons and professionals. A group of knowledgeable physicians makes up the Professional Advisory Council, which sets the policies and procedures for perioperative MH management. The MH hotline is managed by 26 volunteer physicians that provide around-the-clock consultation for known or suspected MH cases. Its subsidiary organizations include the Neuroleptic Malignant Syndrome Information Service (NMSIS) and the North American Malignant Hyperthermia Registry (NAMHR), which collates and analyzes data on patients with suspected or proven episodes of malignant hyperthermia. The NAMHR is directed by Dr. Barb Broom at Children's Hospital of Pittsburgh. Major supporters of MHAUS and its subsidiaries include Proctor & Gamble Pharmaceuticals, ASA, AANA, and individuals and anesthesia departments.

Dr. Rosenberg characterized MHAUS as a not-for-profit organization dedicated to reducing the morbidity & mortality of MH and other heat-related disorders by improving medical care related to MH, providing support information for patients, and improving the scientific understanding and research related to MH and other kinds of heat-related syndromes. He described the various MHAUS services, which include informational brochures, hotline consultation, web site information, a quarterly newsletter ("The Communicator"), publication of treatment protocols, procedure manuals, in-service materials, small grants and awards, and educational presentations.

Dr. Watson took the podium next and described the hotline process and the MHAUS quality improvement (QI) program. Dr. Watson is Chairman of the Anesthesia Department at Bridgeport Hospital in Connecticut, and Co-Director of the surgical intensive care unit there. He has been a hotline consultant for MHAUS for over 20 years, and is Chair of the MH hotline Q/I committee. Dr. Watson discussed the function of the MH hotline, which serves as a voluntary crisis hotline for medical staff on the front line. The hotline consultants provide expertise regarding a rare problem. Trained nurses and physicians are available around-the-clock to answer urgent calls and general questions about management of

suspected or proven MH cases. Hotline consultants are "on-call" for two consecutive weeks, two to four times per year. New consultants are matched with an experienced consultant and mentored during the first year of service.

Dr. Watson described the MHAUS Q/I process, which consists of a quarterly review of advice given by hotline consultants. Although individual management styles and opinions differ, overall advice is consistently good. To conform to HIPPA guidelines, patient information is noted but not shared without patient permission.

These preliminary discussions were followed by the presentation of previous hotline cases and opinions from the experts on the most appropriate management. During and following each case, the audience was encouraged to ask questions and offer opinions. The first case was submitted and discussed by Dr. Richard Kaplan, Professor of Anesthesiology and Pediatrics at Children's National Medical Center in Washington, DC. Dr. Kaplan, who has also served as a hotline consultant for over 20 years, presented the case of a 10 y.o., 40-kg, healthy female that underwent ptosis surgery. Following premedication with oral midazolam, induction of general anesthesia with sevoflurane and N₂O, and endotracheal intubation without muscle relaxants, the surgery progressed uneventfully until one hour later when the child developed PVCs along with hypoxia and hypercarbia. Despite an increase in minute ventilation, hypercarbia persisted, and the child's temperature began to rise. The sevoflurane was discontinued and the propofol was begun. While waiting for the results of an arterial blood gas, the patient was noted to develop generalized muscle rigidity, which triggered the provisional diagnosis of MH and administration of dantrolene. Soon thereafter, the patient developed bradycardia and cardiac arrest, which required over one hour of cardiac resuscitation. Although a sinus rhythm was then established, the child developed rhabdomyolysis and cerebral edema, leading to her death several days after the episode. Dr. Kaplan emphasized that fulminant, acute MH, although rare, remains a cause of perioperative mortality, despite optimal prevention and treatment strategies. He also discussed the role of the anesthesiologist in helping to diagnose MH after the patient's death, and appropriate resources for counseling the family.

Dr. Joseph R. Tobin, Professor of Anesthesiology at Wake Forest University in Winston-Salem, North Carolina led a discussion on the relationship between heat stroke, exercise-induced rhabdomyolysis, and MH susceptibility. Dr. Tobin, a hotline consultant for more than 2 years, presented a series of cases of patients with heat stroke who were also proven to be MH susceptible. A discussion ensued on the current anesthetic management of patients with a history of heat stroke or exercise-induced rhabdomyolysis.

Additional case discussions for the panel included a woman that developed masseter muscle rigidity during rapid-sequence induction of general anesthesia for an emergency C-section, guidelines for ambulatory surgery centers and MH susceptible patients, and management of high fever in critically ill patients.

American Academy of Pediatrics Section on Anesthesiology Breakfast Panel

Pushy Parents, Production Pressure and Crazy Kids; Pediatric Anesthesia in the New Millennium

Moderator: Constance S. Houck, MD

Reviewed by: Anne E. Dickison, MD

Three topics were selected to highlight issues encountered during changed pediatric anesthetic practices brought on by evolving economic forces, time/personnel considerations, product development, regulatory oversight, concerns for potential litigation, and political pressures in health care delivery today. The three topics were sequentially relevant to pre-operative, intra-operative, and post-operative areas of care.

Pre-op: The Science and Politics of Parent-Present Induction

Zeev. N. Kain, MD (Yale U. School of Medicine, New Haven, CT) presented his group's multifaceted study on Parental Presence during Induction of Anesthesia (PPIA), concentrating on the effectiveness of pre-op intervention and instruction. Studies have shown that compared to the effects of Parental Presence alone, children premedicated with oral midazolam are significantly less anxious and more compliant with induction of anesthesia. The Yale group found that PPIA offered no extra anxiolytic benefit than was achieved by oral midazolam without parental presence. On the other hand, parents who accompanied their sedated children into the operating room were significantly less anxious, more comfortable with the separation process, and they reported more satisfaction with the overall anesthetic, nursing, and surgical care given.

Dr. Kain's studies sought to further identify which aspects of parental presence could most benefit the child, parents, and system. If certain behaviors improved both outcome and parental satisfaction, then instruction could be given to parents pre-operatively to modify behaviors and reinforce understanding of how to best contribute.

Identified as positive methods of improving both pediatric and parental stress as measured by cortisol levels, vital signs, self-reporting, and third party observation were 1) Distracting methods (humor, toys, games), and 2) Commands to engage in actively rehearsed coping mechanisms.

Assessed to be of no help during PPIA were 1) Empathy and "Everything will be OK" types of reassurance, 2) Apologizing, 3) Criticizing, 4) Bargaining, and 5) Giving the child control.

On the basis of observations about which of the identified parental behaviors practiced pre-operatively could potentially improve a child's stress markers over midazolam alone, and concurrently reduce parental anxiety and/or improve parents' perceived satisfaction, an early intervention program was set up for clinical investigation. This program utilizes an instructional video, coaching, and phone calls starting a week before the planned anesthetic. Follow-up occurred in the PACU, prior to discharge, and two weeks after the procedure. Study groups were

divided into those that ultimately received oral midazolam preoperatively (as well as PPIA interventional instruction), and those that ultimately received PPIA instruction alone.

Politics influencing pediatric anesthesia practice, patient flow, and system permissiveness vary by institution, geographic part of the country, economic basis, surgeon acceptance, nursing beliefs, level of education and expectations of the population, personnel availability and distribution, and administrative vision. Successful introduction of any program of pre-operative parental instruction involves significant changes and buy-in from the various components. Local demographics and patient referral patterns tend to determine surgeon acceptance and their willingness to funnel parents into an instructive PPIA system as the child's surgery is scheduled. Among hospital administrators, 50% discourage pre-operative parental intervention, and only 10% of those surveyed supported the idea. Nurses, however, strongly support the idea of instructed PPIA, but their advocacy is not based on science, so it becomes easy for those in decision-making capacities to dismiss. To convince administrators, surgeons, nursing personnel, and other system components, data is necessary to prove that benefit is worth the added expense, effort, time, and disturbance to the way things are being done at present.

Studies have established that in general parents want to be with their child during induction of anesthesia, but that over 90% of those who do go into the operating room experience significant anxiety. Thirty-two percent of parents change their minds about wanting to accompany their child to the OR if they see their child sedated in the holding area pre-operatively. Parental heart rate is highest upon entering the operating room, then diminishes during induction. Instructed parents show the same pattern but to a lesser degree. PP improves satisfaction with or without the use of sedatives.

More questions were directed to Dr. Kain than he had time to answer. Sample questions:

*Q: Were behavior changes [bedwetting, nightmares, school phobias, temper tantrums, etc.] or perceptions of satisfaction changed on a long-term basis? Dr. Kain: The midazolam group did benefit during the first seven days. Longer term effects of instructed PPIA and use of pre-operative sedation for a single operative procedure are not feasible to study because of the frequency of interaction by other unrelated factors like divorce, job loss, economic duress, birth or death of another sibling, need for further surgery, and a host of other influences on child and parent emotional well-being.

*Q: How about Frequent Flyers? Dr. Kain: Results depended on the child's baseline personality and his previous exposure. Parents still wanted to go into the OR.

*Q: Mother versus father? Dr. Kain: No difference in frequency of parental benefits, though mothers did report a higher anxiety during induction. To the child it did not matter whether the mother or father was the present parent in either the midazolam or non-midazolam groups.

Continued on page 10

*Q: Have you ever sedated the parents? Dr. Kain: Problems with informed consent, who is responsible for supervision post-operatively, and driving home are all prohibitive issues. Acupuncture has been studied and is helpful, however. There may be a role for biofeedback, self-hypnosis, and other methods of non-pharmacologic intervention for achieving anxiety reduction for the parents of Frequent Flyers.

Intraop: When and Why Should We Use Remifentanyl?

Peter J. Davis, MD (Children's Hospital of Pittsburgh, Pittsburgh, PA), pointed out that in patients less than 30 days of age, there are no labeled used for opioids, but neither do there exist any official sanctions for dopamine, dobutamine, or other drugs in common use in the neonatal population. Approval in the PDR is in large part a function of the drug industry's interest in doing studies. Consent for clinical trials, medicolegal worries, economics of reimbursement, nature of the population, and other factors inhibit processes for studying and approving potentially important agents to use for neonatal surgery.

Dr. Davis reviewed a history of landmark studies evaluating opioids for use during procedures on neonates. Cited were Kupferberg (1963): baby rats were more sensitive to morphine sulfate, and had a higher death rate when given the same mg/kg dose. On necropsy they also had higher brain concentrations than their older controls. Zhang (1981): Mu and Mu-2 receptor pool increase with age, so the young get less analgesia from the same serum concentration. Robinson and Gregory (1970s-80s): The philosophy at this time for management of the sick neonate was to reduce lung water as much as possible, so babies were routinely and intentionally severely dehydrated. If Fentanyl 30 mcg/kg were administered during induction of anesthesia (as was advocated for congenital heart surgery), the blood pressure would inevitably bottom out. By preparing them with LR 10 cc/kg, the babies tolerated a fentanyl induction much better. Anand (1987): Classic demonstration that physiologic parameters of stress metabolism and survival statistics improved with the use of fentanyl during congenital heart surgery. Hertzka (1989): incidence of opioid-associated apnea was higher in neonates. Anne Lynn: Morphine sulfate concentration was the determining factor for prediction of respiratory depression.

Discussing challenges to pharmacokinetic studies, Dr. Davis observed that individual variability of drug response in adults was 10-15%, and was even bigger in neonates. A drug resulting in less variability of response has a greater predictability of action. The most predictable responses occur when the drug does not accumulate, and when it does not require the liver for metabolism and excretion. With its highly lipid constitution, immature hepatic metabolism, and preoccupation by the liver for doing other chores like conjugating bilirubin, the neonate is particularly disadvantaged in terms of variability of response. He posited that studying variability of response of neonates to various opioids could potentially predict frequency of adverse side effects.

Plotting Clearance (Y-axis) versus Duration of Infusion (X-axis), Dr. Davis plotted accumulation curves and hence determined variability for Fentanyl vs. Alfentanil vs. Sufentanil vs.

Remifentanyl. Fentanyl had the steepest slope and accumulated the most. Remifentanyl had the flattest slope and hence accumulated the least. Remifentanyl ended up with a 40% variability score, which was 1/3 of all others. The conclusion was that remifentanyl, because of this "best" variability profile, offered significant advantages to the neonatal patient.

In a study of well neonates undergoing surgery for pyloric stenosis, anesthetics with remifentanyl were compared with variability scores obtained for a customary and standardized protocol for halothane. Awake extubation times were virtually identical. Variability measurements with remifentanyl were half that of halothane, however. The conclusion was that remifentanyl had a greater predictability of action than traditional halothane, and was hence more desirable. Furthermore, all patients received pre-op and post op pneumograms to assess their index of apnea. No babies with normal pre-op pneumograms had abnormal post-op apnea indices. In the halothane group, however, 3 out of 10 babies converted to abnormal apnea indices post-operatively. Results of this second method of clinical assessment correlated with determinations of variability from pharmacokinetic studies done on the same study group.

Postop: Wild in the PACU

Ira Todd Cohen, MD (Children's National Medical Center, Washington, DC) started out his session with a hilarious animated cartoon depicting emergence agitation and its effect on serenity in the PACU. Dr. Cohen deserves technical and artistic kudos for bringing down the house.

Studies of emergence delirium are especially difficult to conduct and compare due to the variety of assessment tools and scales; definitions about what behavior constitutes disturbance during what specific periods of time; difficulties interpreting behavior in non-verbal populations with other influencing factors like pain, hunger, fear of strangers; and disagreeing opinions about the point at which a "normal" emergence transcends into the spectrum of "abnormal" post-operative dementia.

DSM IV breaks down delirium into 1) Disturbance of consciousness, 2) Change in cognition, and 3) Fluctuations in the course of disturbance. Various scales used to study post-op delirium have included 3-point (1994); EAS: 5-point (2000); PAE: 5-point (2002); PAEDS: 5-point (2002), and PABA: DSM IV (2003) observation by trained psychologists.

Risk factors for post-op delirium in the child less than 5 years of age, as reported by Voelpel-Lewis (in A&A 2003) include ENT and Ophthalmologic surgery, volatile anesthetic agents, intraoperative opioids, rapid emergence, and low adaptability.

The incidence of emergence dysphoria in all comers was 12-18% and was highest on arrival from the OR to the PACU. Emergence delirium with desflurane was 40-60%, and was about the same for both painful and painless procedures. The incidence cited for sevoflurane was 30-50% whether or not the child arrived in PACU sleeping or was already agitated at the time of transport.

Posited mechanisms of action include drug disposition, rapid emergence, dissociated states induced by various parts of the brain coming out of anesthesia at different rates, coexistent pain, underlying brain anatomy/chemistry/immaturity, and other factors influencing metabolism and excretion. The rapidity of emergence

and coexistence of inadequately treated pain are not the full story, however, or the incidence of emergence dysphoria after a remifentanyl-based anesthetic would not be less than what is seen with most other anesthetic agents, which is what has been observed in several other studies.

Emergence phenomena leads to higher complication rates: increased bleeding from operative sites, pulling out of drainage tubes and IVs, pulling off of dressings, increased perception of pain and administration of pain medications, increased use of sedative medications with potential for drug interaction or increased respiratory depression, unhappy parents and nurses, disturbance and agitation of other patients in the PACU, and prolonged stays. To decrease the incidence of post-operative complications and prolongation of PACU stays, it is important to try to identify patients at risk for emergence delirium, or methods to abort it once it has occurred.

Recommendations and observations coming forth from studies for preventing emergence phenomena in the pediatric patient include:

- 1) Avoid volatile agents (propofol and remifentanyl seem to work very well for most procedures).
- 2) Fentanyl 1.25 mcg/kg for T&As, or intranasal fentanyl 1-2 mcg/kg for PE tubes
- 3) Ketorolac decreased post-op agitation in both sevoflurane and halothane groups
- 4) Propofol inductions did not decrease the incidence of post-op dysphoria
- 5) Midazolam pre-operatively or intraoperatively did not prevent and just seemed to delay emergence agitation occurring in the PACU
- 6) Oxycodone (Murray, 2002) did not decrease the incidence of agitation
- 7) Tramadol (Murray, 2002) did not decrease the incidence of agitation

Observations from the audience:

*Dr. Charles Cote: In one of our studies in children with working caudals, the incidence of delirium was higher with sevoflurane than halothane on admission to PACU, but after five minutes, the incidence became the same.

*Dr. David Polaner, quoting Dr. Elliot Krane: "Their ids wake up before their egos." Dr. Polaner endorsed the idea that different parts of the brain woke up at different rates. He referred the group to a poster on the role of GABA receptors on awakening.

*Q: Once it happens, how should it be treated? Moderator: put the child back to sleep with propofol and let them wake up again. Dr. Cohen: administration of fentanyl (rather than meperidine or morphine) in the PACU.

*Q: What is the best technique for a 5-year old for T&A? Dr. Cohen: Personally I prefer the combination of desflurane and fentanyl. Many institutions without access to desflurane are going back to halothane. Some anesthesiologists use a mask induction with sevoflurane but convert to isoflurane for the remainder of the anesthetic.

Tuesday Morning General Pediatric Anesthesia Poster Discussions and Poster Sessions of General Pediatric and Pediatric Cardiac Anesthesia

Reviewed by: Valerie E. Armstead, MD, FAAP

October 14, 2003 at the ASA annual meeting was a busy morning for those interested in pediatric anesthesia. The above sessions occurred simultaneously. This proved to be a challenge to those trying to cover all bases of the subspecialty. A variety of issues germane to the care of infants and children requiring anesthesia for surgery or diagnostic procedures were covered this fall. A special emphasis was given to the well-represented cluster of free standing posters related to pediatric cardiac anesthesia.

The morning (09:00 to 10:30) pediatric posters were not discussed in the order published in the abstract booklet, this order will be followed for the members not able to attend the meeting. There were eight posters slated for discussion:

A-1445 *A Multicenter, Randomized Study To Determine the Pharmacokinetics and Pharmacodynamics of Fenoldopam Mesylate in Pediatric Patients*. Susan T. Verghese, MD; Gregory B. Hammer, MD; George Lavandosky, MD; Myron Yaster, MD; Joseph R. Tobin, MD; Departments of Anesthesiology and Pediatrics, Children's National Medical Center and George Washington University, Washington DC.

In this multicenter study of this unique drug used to lower blood pressure for hypotensive anesthetic techniques the findings were presented by Dr. Verghese. Fenoldopam 1.0-1.2 mcg/kg/min was found to cause clinically significant reductions in MAP in pre-adolescent children; while greater dosages conveyed little additional benefit. This effect is consistent with PK/PD findings in adults.

A-1446 *Risk Factors for Severe Postoperative Vomiting in Pediatric Patients*. Mehernoor F. Watcha, MD; Christopher Lee, MD; Jun Park, MS. Anesthesiology & Critical Care Medicine, Children's Hospital of Philadelphia, Philadelphia, PA.

The aim of this study presented by Dr. Meb Watcha, was to identify patient, surgical and anesthetic factors associated with an increased risk for severe postoperative vomiting (POV) as ≥ 3 episodes in the first 24 hours after anesthesia. Multiple logistic regression on data extracted from 52,269 computerized anesthetic records identified factors associated with 3 episodes or more of postoperative vomiting in children. ASA 1 or 2 females above the age of 11 years, with a previous history of POV, undergoing long surgical procedures (e.g. middle ear surgery), on an outpatient basis were the pediatric patients with the highest risk for severe POV. These patients may benefit from multimodal POV prophylaxis while sparing the other less affected 2/3rds of the pediatric patient the cost burden

Continued on page 12

A-1447 *The Effects of Alterations in Ventilation on Cerebral Oxygen Saturation among Infants after Bidirectional Superior Cavopulmonary Connection* Stephen A. Stayer, MD; Ahmed Alomrani, MD; Tia Tortoriello, MD; Zeev Perles, MD; Mott R. Antonio, MD; Divisions of Pediatric Cardiovascular Anesthesiology and Pediatric Cardiology, Baylor College of Medicine, Houston, TX.

This study addressed the fact that after bidirectional superior cavopulmonary connection (BSCPC), increasing pH and lowering pCO₂ will increase cerebral vascular resistance and lower pulmonary vascular resistance. However, hyperventilation has been shown to decrease PaO₂ after BSCPC. The purpose of this study was to determine the effects of alterations in ventilation on cerebral oxygen saturation (rSO₂), systemic oxygenation, and hemodynamics among infants after BSCPC. These authors found out that infants may develop significant hypoxemia. Avoiding hyperventilation, and possibly producing mild hypoventilation will optimize both systemic and cerebral oxygen saturation. BSCPC infants benefit from normoventilation and even mild hypercapnia when appropriate. Dr. Jerry Lerman made a comment from the audience that perhaps high-frequency oscillating ventilation (HFO) might have been the better mode of ventilation as the intrathoracic pressures should remain normal in this setting.

A-1448 – *Milrinone and Nitric Oxide: Combined Effect on Pulmonary Artery Pressures Following Cardiopulmonary Bypass in Children*. Vadim Khazin, MD; Yefim Kaufman, MD; Lior Sasson, MD; Peter Szmuk, MD; Tiberiu Ezri, MD; Anesthesiology, Edith Wolfson Medical Center, Hulon, Israel.

Dr. Khazin presented data addressing the management options of perioperative pulmonary hypertension that include but are not limited to NO and milrinone. An advantage of NO is the lack of systemic hemodynamic effect as it is administered directly to the pulmonary circulation. This group assessed the effect of a combination of milrinone or nitric oxide (NO) versus each drug given alone, in reducing pulmonary artery pressures following CPB in children undergoing surgical repair of congenital heart defects. The authors concluded that a combination of milrinone and NO produced a more pronounced decrease in PAP than each drug separately.

A-1449 *Cerebrovascular Hemodynamics in Children during Anesthetic Emergence: Propofol vs Desflurane*. Ross Barlow, MD; Cengiz Karsli, MD; Igor Luginbuehl, MD; Bruno Bissonnette, MD; Department of Anesthesia, The Hospital for Sick Children, University of Toronto, Toronto, Ontario, Canada.

Dr. Barlow presented a study investigating the effects of propofol versus desflurane and measured the effects on cerebral blood flow using middle cerebral artery blood flow velocity. Remifentanyl was used throughout the study period. There was a 54% increase in middle cerebral artery blood flow velocity when propofol was discontinued and desflurane was added at 1 MAC concentration. Heart rate and mean systemic arterial pressure did not change, which was thought to be due to the concurrent use of

remifentanyl. The authors concluded that desflurane should be used with caution in children with altered cerebral compliance.

A-1450 *Peak Inflation Pressure (PIP) Measured at the Tracheal End (PTrach) of the Endotracheal Tube (ETT) Is More Accurate Than PIP Measured by the Ventilator (Pvent) in Children with Respiratory Failure*. B. Craig Weldon, MD; Rogelio H. dela Cruz, MD; Michael J. Banner, PhD, Anesthesiology and Pediatrics, University of Florida, Gainesville, FL.

Dr. Craig Weldon presented a study comparing the measurement of peak inspiratory pressure (PIP) at the very tip of the endotracheal tube (ETT) tip as opposed to mean PIP as measured by the mechanical ventilator. The distal ETT PIP was measured by means of an internal sideport catheter embedded by the manufacturer. As was suspected by the investigators, the distal ETT PIP was significantly lower ($p < 0.05$) compared to the PIP reported by the ventilator. It was also noted that the difference between the two PIP measurements was greatest in situations where the peak inspiratory flow rates were high. The authors concluded that caution should be used when considering make a change in mechanical ventilator settings based on ventilator-reported PIPs. Furthermore, the difference between the two PIPs (Pvent) and (PTrach) in children with respiratory failure is exaggerated at high flow ventilator rates. Members of the audience asked if PIP measurement should routinely be measured at the distal ETT tip. Dr. Weldon responded that in an ideal environment, PTrach measurement would be preferred.

A-1451 *Reduction in Perioperative Blood Loss Following Surgery for Scoliosis: A Prospective, Randomized, Double Blind Examination of Epsilon Aminocaproic Acid*

Ivan Florentino-Pineda, MD; Dale E. Williams, MD, PhD; George H. Thompson, MD, Department of Anesthesiology, University Hospitals of Cleveland, Cleveland, OH.

This study, presented by Dr. Pineda, examined the impact of epsilon aminocaproic acid (EAA) on the perioperative blood loss occurring during surgical correction of idiopathic scoliosis in adolescents. EAA was chosen, as it is an antifibrinolytic shown to reduce perioperative blood loss in other populations. A total of 36 patients were studied, 19 patients received EAA and 17 were in the control group. Analysis of variance detected no statistically significant differences between groups preoperatively. Total perioperative blood loss was less in the EAA group (1,389 ml vs. 1,720 ml; $p \approx 0.05$). Furthermore, postoperative hemoglobin (8.4 gm/dL vs. 7.2 gm/dL; $p < 0.001$) and hematocrits (25.2% vs. 21.8%; $p < 0.001$) were significantly higher in the Amicar group while total autologous blood transfusions were lower (1.0 unit vs. 1.6 units; $p < 0.05$). The authors concluded the use of EAA during anesthesia for scoliosis repair should lead to a practice of reduced autodonation and a significantly reduced need for blood transfusion.

Complete poster review is available on the Web Newsletter

American Academy of Pediatrics Section on Anesthesia and Pain Medicine Update

The AAP Section on Anesthesia and Pain Medicine has had a busy year. We've been able to play an important role networking with other groups within the AAP and giving input into statements, nominations, legislative advocacy, print media articles and educational presentations and publications.

The Committee on Drugs is working on several projects including working with the pediatric dentists on the latest revision of the Sedation Guidelines. The Committee is also taking a lead in the pediatric drug labeling effort. Section exec. Committee member, and COD member, Lynne Maxwell is also contributing to a review of the Pediatric Advanced Life Support (PALS) course.

The Executive Committee was very happy to see one of its' own, nominee, Zeev Kain succeed in becoming a member of the editorial board of *Pediatrics*.

The AAP Annual Meeting was held in New Orleans in October. Five educational offerings by section members included:

1. "Sedation in the Radiology Suite: How to Make it Safe and Effective" by Shobha Malviya, MD
2. "Postoperative Behavioral Changes in Infants and Children: What a Pediatrician Should Know" by Zeev Kain, MD
3. "Acupuncture Workshop for Pediatricians" by Yuan-Chi Lin, MD (presented twice)
4. "Creating a 'Pain Free' Pediatric Environment in the Pediatric Office" by Steven J. Weisman, MD and Jolene D. Bean-Lijewski, MD, PhD

Once again, Education Committee Chair, Connie Houck, MD did a superb job in preparing our program. Executive Committee Chair, Patty Davidson, MD represented the section at the Surgical Advisory Panel meeting. This is a group of the eight surgical sections of the Academy.

The Section spoke in favor of the California Society of Anesthesia's report to the ASA at the last House of Delegates meeting. This report (305-1.2) described California's policy on pediatric anesthesia. This policy was an application of the Academy's statement on the Pediatric Perioperative Environment. California's policy states that the medical staff should have a written policy defining the perioperative care of pediatric patients that may be appropriately provided. Age, risk categories, facility equipment, availability of experienced personal should be considered. It went on to state that general anesthesiologists who can document current competence in the care of patients in these specified categories should be awarded these clinical privileges. Pediatrics patients in a higher risk category should be cared for by anesthesiologists who have either graduated from an ACGME accredited pediatric anesthesia fellowship or who are credentialed by their department based upon demonstration of current competence in the care of such patients. The concept of a "minimum case volume to maintain clinical competence" was introduced. It was recommended that this be determined locally.

Phoenix in March should be great for the upcoming joint meeting with the Society of Pediatric Anesthesia. The AAP Advocacy lecturer this year will be Joanne Wolfe, MD from Boston Children's Hospital and her talk will be on Palliative care in children. The section looks forward to presenting the Robert M. Smith Award for lifetime achievement as well as the Jack Downes Award for Resident Research. There will be workshops, PBLDs, lectures, networking and fun for everyone. See you in the sun!

Patty Davidson, MD, FAAP, Chair

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Literature Reviews

Early Exposure to Common Anesthetic Agents Causes Widespread Neurodegeneration in the Developing Rat Brain and Persistent Learning Deficits.

Jevtovic-Todorovic V, Hartman RE, Izumi Y, Benshoff ND, Dikranina K, Zorumski CF, Olney JW, Wozniak DF. *J Neurosci* 2003; 23:876-882.

Reviewed by: Constance Moniotti, MD
Johns Hopkins, Baltimore, MD

Findings: Exposure of infant rats on day 7 of life (a time of developing brain growth, synaptogenesis, and maximal sensitivity to NMDA antagonists in rats) to 6 hours of general anesthesia consisting of isoflurane alone (0.75-1.5%) or in combination with midazolam (9 mg/kg, i.p.) \pm N₂O (75%) results in acute apoptotic neuronal depletion in the developing brain. Specific learning and memory disabilities (abnormalities in Morris Water Maze and Radial Arm Maze testing) also occur and persist into rat adolescence and adulthood. Apoptotic neurodegeneration was most dramatic in the setting of co-administration of the three anesthetic agents. Apoptosis was not seen when either midazolam (3-9 mg/kg i.p.) or N₂O (50-150 vol%) was given alone. These effects were hypothesized to occur as a result of the GABA-mimetic (isoflurane and midazolam) and NMDA receptor antagonistic (N₂O) properties of the anesthetics tested.

Impression: While these findings raise serious concerns as to the deleterious effects of anesthetic agents on the developing brain, it is impossible to know whether these findings are clinically relevant to human neonates and infants undergoing general anesthesia. First of all, the timing of these experiments is very specific and may be critical to interpreting their results. Prior studies in rodents have shown that rodent brains are maximally sensitive to NMDA receptor antagonist-induced neuronal apoptosis in the first week of post-natal life, and effects are no longer seen by two weeks of age. In addition, effects are only seen once anesthetic duration exceed 4-6 hours.¹ Hence, should we not worry if our patient's anesthetic exposure is brief? In addition, the first two weeks of post-natal life for a rat correspond to a time of human brain development beginning in the third trimester and lasting until the third year of life. One has to wonder, therefore, if there is a window of vulnerability that may occur to a different degree or at a very different time in humans, or must we instead worry that neonates through toddlers are at risk from general anesthesia.

Another caveat with this study involves variability of drug potency/effects across species. While the MAC of volatile anesthetics is very similar (less than a two-fold difference for isoflurane) across diverse species, the efficacy of many intravenous drugs is not. Here, for example, the authors suggest that because they observe sedation in rats with a dose of midazolam

of 3-9 mg/kg i.p. that this should be comparable to our dosing of midazolam in humans (0.1 mg/kg IV/IM -1.0 mg/kg p.o.). This difference in potency, however, suggests that various receptor densities across different species may be grossly different and, thus, sensitivity to toxic effects of drugs may differ as well. Thirdly, prior studies in rodents demonstrating the toxic effects of ethanol on the developing brain have a clear corollary in human disease (fetal alcohol syndrome). However, to date, despite years of providing anesthesia to patients ranging from fetuses to critically ill preterm babies to healthy neonates and infants, there is no clear clinical corollary in humans to the findings presented here. While this may be related to the subtlety of the neurodevelopmental changes observed (what is the human equivalent of a Water Maze challenge?), or to other confounding variables, as the authors suggest, it is also possible that the findings seen here cannot be directly translated from the rat brain to the grossly different human brain.

In conclusion, this study raises some important questions about the effects of drugs that are integral to our every day practice. Real changes in practice, however, should await laboratory studies in which these experiments are extended to higher mammals, as well as controlled clinical studies designed to assess neurodevelopmental development in children who undergo general anesthesia in the fetal, neonatal, and toddler periods.

1. Ikonomidou C, Bosch F, Miksa M, Bittigau P, Vockler J, Dikranian K, Tenkova TI, Stefovskva V, Turski L, Olney JW. Blockade of NMDA receptors and apoptotic neurodegeneration in the developing brain. *Science* 1999; 293:70-74.

Literature Reviews on the Web

Hyperkalemia and Pyloric Stenosis.

Schwartz D, Connelly NR, Manikantan P, and Nichols JH. *Anesth Analg* 2003; 97:355-7.

Reviewed by: Helen V. Lauro, MD

Laryngeal mask insertion in children: a rational approach

Kundra P, Deepak R, Ravishankar M. *Paediatric Anaesth* 2003;13:685-690.

Reviewed by: Sam Golden, MD, FAAP

Remifentanyl Infusion for Cleft Palate Surgery in Young Infants

Roulleau P, Gallo O, Desjeux L, et al. *Paediatric Anaesth* 2003;13:701-707.

Reviewed by: Cheryl K. Gooden, MD, FAAP

Fellow's Corner

This segment presents topics of interest to anesthesiology trainees interested in pediatric anesthesia and are not endorsed or necessarily representative of the views of the Society for Pediatric Anesthesia. In this issue the topic of non-ACGME approved fellowship training programs for pediatric anesthesia is discussed by Dr. Joe Tobin from Wake Forest University. This topic is relevant in light of both the high demand for pediatric anesthesiologists and the increase in residents seeking post-anesthesiology residency training positions. The result of which has led to an increase in the number of people seeking and accepting unapproved fellowships. To provide a balanced view, this same topic will be discussed in the next issue by a member of the ACGME section for pediatric anesthesia. As always, please e-mail any commentary you have and I will be happy to add it to the next newsletter.

Fellows corner is an excellent opportunity for future pediatric anesthesiologist to present their viewpoint or ask question about articles, current controversies in anesthesia, or fellowship training. Additionally, it allows trainees an early exposure to the SPA. Questions, commentary or reviews can be sent to jeffrey.galinkin@uchsc.edu. Include your name and hospital affiliation and whether you want these included if printed.

Jeffrey Galinkin, MD
UCHSC/ The Children's Hospital, Denver

Non-ACGME approved fellowship training programs for pediatric anesthesia

As of November 2003, the ACGME lists 43 approved training programs in pediatric anesthesia (www.acgme.org). Some programs are composites of multiple previous training sites and many are stand alone Children's Hospitals affiliated with a parent training program in Anesthesiology. One of the shared goals of the SPA, AAP and ACGME is to enhance the educational opportunities for physicians. Development of approved training programs in pediatric anesthesia (without subspecialty certification) certainly is consistent with this goal. However, some other training programs also offer non-approved training in pediatric anesthesia.

Non-approved training programs are not necessarily programs that applied for approval and were denied. Some of these sites are just entering into the pediatric training program arena without having submitted their site for evaluation. In general hospitals, pediatric patients may not be cohorted to dedicated pediatric operating rooms, or faculty may be covering adult patients in an adjacent room. Some centers may believe that they would not qualify due to a lack of faculty academic productivity or research opportunities directly related to pediatric anesthesia. It could be said that these centers may fall below the threshold where we would like to train new specialists. I would argue that is not necessarily the case.

We have seen the difficulty created by the AAP in requiring subspecialty training programs to show evidence of scholarship by all finishing fellows. It is clear that the standard did not work and has been reconsidered. Although I am an academic physician, I recognize that not all specialists who would like to train in pediatric anesthesia are interested in anything other than providing excellence in clinical care to children for their careers. Some programs see great residents finishing who would like to spend more training time in pediatric anesthesia and the resident does not wish to relocate to an approved program for one year only to return to the general area of their residency. With more two professional couples, this dual training also causes temporal and distance difficulties. Therefore, some programs consider offering a clinical fellowship with appropriate educational materials and clinical experience for a select person.

We believe there is a special nature to administering anesthesia to children, as do our colleagues with special training in cardiovascular anesthesia and neuroanesthesia. Neither cardiovascular anesthesia nor neuroanesthesia have ACGME certified fellowship programs. Did we not all learn from accomplished mentors in each of these fields during our training – either during a primary residency or subspecialty training to follow? And what of those who trained prior to ACGME approval? Were these leaders in the field not the consultants regarding the attributes required and later proffered by the ACGME?

I do not advocate that any clinical facility open up their doors proclaiming themselves to be an excellent training program in pediatric anesthesia without some question of credentialing. For those of us in institutions where we can make the grade for ACGME approval, we should be starting the application process. As far as I can see, there will never be a sufficient supply of well trained pediatric anesthesiologists. For those institutions which choose not to apply for ACGME approval and recognition, careful consideration must be given to providing a sufficiently stimulating and competent training program. Whether the resident will see all types of pediatric anesthesia required by the ACGME or get sufficient pediatric cardiac or liver transplant experience may be variable. However, with greater numbers of clinicians receiving clinical and academic training, we'll assure educators and leaders for tomorrow. Kudos to the programs that have already passed the ACGME approval format. I know we have more to follow. I'd like to see more clinical and academic physicians in pediatric anesthesia!

Joe Tobin, MD
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The Society for Pediatric Anesthesia (SPA) was founded in 1987 to promote quality perioperative care for infants and children. Membership in SPA has more than 4000 members. Membership consists of community-based and academic physicians who have an interest in pediatric anesthesia, as well as resident and affiliate members. The goals of SPA include:

1. To advance the practice of pediatric anesthesia through new knowledge
2. To provide educational programs on clinical, scientific, and political issues that are important to pediatric anesthesia practice
3. To promote scientific research in pediatric anesthesia and related disciplines
4. To provide a forum for exchange of ideas and knowledge among practitioners of pediatric anesthesia
5. To support the goals of the American Society of Anesthesiologists and the American Academy of Pediatrics

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