

Pediatric Anesthesia Update 2013


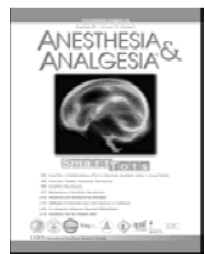
Rita Agarwal
Professor of Anesthesiology
University of Colorado

The 10 most frequently asked questions listed in order of frequency among responders

- What is the clinical relevance of neurotoxicity of general anesthetics?
- Does regional blockade improve outcome in children?
- What is the best anesthetic management for children with pulmonary hypertension?
- How do we eliminate emergence agitation?
- What is the optimal intravenous fluid?
- How do pharmacokinetics and pharmacodynamics change with age?
- What is the optimal sedation and analgesia in pediatric intensive care?
- How do we optimize postdischarge pain management?
- How can we use pharmacogenetic information in children?
- What are the long-term consequences of opioid use in children and how can we reduce the side effects of opioids?

Pediatric Anesthesia
22 (2012) 613–615

Anesthesia Effects on the Developing Brain

- [J Neurosurg Anesthesiol](#), 2012 Oct;24(4):382-8. doi: 10.1097/ANA.0b013e31826a0371.
- **Feasibility and pilot study of the Pediatric Anesthesia NeuroDevelopment Assessment (PANDA) project.** [Sun LS](#), [Li G](#), [DiMaggio CJ](#), [Byrne MW](#), [Ing C](#), [Miller TL](#), [Bellinger DC](#), [Han S](#), [McGowan FX](#).
- [J Urol](#), 2012 Nov 20. pii: S0022-5347(12)05594-2. doi: 10.1016/j.juro.2012.11.090. [Epub ahead of print]
- **Newly Postulated Neurodevelopmental Risks of Pediatric Anesthesia: Theories That Could Rock Our World.** [Hays SR](#), [Deshpande JK](#).

AAP News Volume 34 • Number 1
January 2013
www.aapnews.org

Consensus statement reflects mixed picture on anesthesia's possible link to learning problems

by [Allyson Salasnik Weyhoff](#) • *Associate Editor*

SmartTots

More studies are needed to determine if anesthetic and sedative agents administered to young children have a negative effect on learning and behavior, according to a new AAP-endorsed consensus statement from SmartTots, a public-private partnership between the Food and Drug Administration (FDA) and the International Anesthesia Research Society.

SmartTots (Network for Mitigating Anesthesia-Related Acute Risks in Tots) was organized to shed light on the safety of children undergoing anesthesia and to help fund research for medical professionals and parent health care providers.

Research in young animals published since the late 1990s has demonstrated memory and learning difficulties in response to anesthetic agents. Research in humans, however, is currently inconclusive.

Is early exposure to anesthetic or sedative agents associated with later deficits in learning or behavior? Research on humans is mixed. While experts continue to study the issue, an AAP-endorsed statement says it is unclear if repeated sedation and anesthesia affect memory. Millions of U.S. children undergo surgery or other procedures annually.

© 2013 American Society of Pediatric Anesthesiologists

Anesthesia Before Age 2 May Be Linked With Learning Disabilities Later On



Alamy: Connie Cooper-Lewis

The Huffington Post: Amanda Clear [Twitter](#) [Facebook](#) [Google+](#)
Feed Dawled: 10/05/11 01:16:00 PT | Updated: 10/05/11 08:08:00 PT

TOP LINKS ON THIS TOPIC 4 of 6

Children's anesthesia linked to learning disability
Health | CBC News

Warning to parents: Anesthesia used in surgical procedures for babies and toddlers causes learning disabilities

Symposier - Mayo Clinic Study on Anesthesia and Learning Disabilities in Children

Around the Web:

- Study Links Anesthesia To Learning Disabilities - NIH
- Study: Anesthesia in Infancy Linked to Later Disabilities - TIME
- Anesthesia Exposure Linked To Learning Disabilities In Children
- Repeat Anesthesia for Tots May Lead to Learning Disabilities - In
- Anesthesia use in kids linked to learning disabilities - The Chant ...
- Repeated Early Anesthesia Exposure Linked to Learning Disabilities
- Study Links Anesthesia With Learning Disabilities - Health News ...
- Anesthesia in Youngest Kids May be Linked to Learning Disabilities ...

Wolters Kluwer | OvidSP

Search Journals My Workspace Nursing/Ovid

My Projects

PANDA SYMPOSIUM PROCEEDINGS

Feasibility and Pilot Study of the Pediatric Anesthesia NeuroDevelopment Assessment (PANDA) Project


Lena S. Sitt, MD,* Ganhua Li, MD, DrPH,† Charles J. DiMaggio, PhD,‡
Mary W. Byrne, PhD, DNP, FAAN,† Caleb Ing, MD,§ Tonya L. K. Miller, MD, FAAP,||
David C. Bellinger, PhD, MSc,¶ Sona Han, MA,§ and Francis Y. McGowan, MD||

Background: Animal studies have demonstrated that exposure of the developing brain to commonly used anesthetic agents induces neurotoxicity and later abnormal neurobehavioral functions in adults. Results from clinical studies have all been analyzed using varying data sets, and these studies produced inconsistent results. To provide more definitive evidence to address the clinical relevance of anesthetic neurotoxicity in children, an interdisciplinary team of investigators designed and

...ing pair underwent a direct testing using the Wechsler Abbreviated Scale of Intelligence (WASI) and the NIH NeuroPsychological Assessment, second edition (NIHNSY II), and the parents completed questionnaires related to behavior using the CBCL and Conners rating. Data are presented as means ± SD. We conducted descriptive analyses of the demographic data. We compared both the exposed and the unexposed sibling groups on WASI and NIHNSY II, and total and F scores from CBCL and Conners rating sets

Volatile and Other Anesthetics

- Young rodents and other animals have shown ↑apoptosis and cell death during critical periods of brain development
- It appears that a very fine balance between neuronal excitation and inhibition in the CNS is crucial, not only for neuronal survival, but for proper maturation and functioning
- Most anesthetics and sedatives increase inhibition



Volatile and Other Anesthetics

- Over-inhibition, just like over-excitation, may be toxic to a developing neuron
- The same agents that may cause over-inhibition of the neuronal system are also neuroprotective during both focal and global ischemia
- All volatile anesthetics, midazolam, propofol and ketamine have been implicated
- So far opioids seem to be OK

Of Mice and Men

<ul style="list-style-type: none"> • Mice • Brain Growth Spurt: first 1-2 weeks of life • Anesthetized for 5-6 hours • Many unmonitored • Pain and surgical stress are harmful 	<ul style="list-style-type: none"> • Humans • Brain Growth Spurt: prenatal-24 months • Equivalent to several days-months • Monitored • Pain and surgical stress are harmful
--	---

3 Editorials in Anesthesiology

- **Anesthesia and Neurodevelopment in Children: time for an Answer?** Sun et.al Nov 2008.
 - Large new epidemiologic based study to examine effects of anesthesia exposure in children < 3 under way
 - Siblings used as case controls, 1° outcome; global intelligence and specific domain measures etc in late childhood.

SMART TOTs

- Multidisciplinary team of researchers
 - IARS and FDA working in partnership
 - Drs Roizen and Mehmet Oz
 - Sponsoring many ongoing trials investing both animal and human data
- Timing of exposure
- Duration of exposure
- Multiple exposure
- So far human results are mixed

- [Pediatric anesthesia neurotoxicity: an overview of the 2011 SmartTots panel](#)
- Jevtovic-Todorovic V. *Anesth Analg*. 2011 Nov;113(5):965-8.
- [Risk, Error, Outcome, and Prevention in Pediatric Anesthesia: so many issues, lots of good solutions, but where do we find the resources?](#)
- Coté CJ. *Paediatr Anaesth*. 2011 Jul;21(7):713-5.
- [Neurodevelopmental outcome following exposure to sedative and analgesic drugs for complex cardiac surgery in infancy \(pages 932–941\)](#) *Peds Anes Sept 2011* Gonzalo Garcia Guerra—no differences

Abstracts from IARS 2011

- **LONG-TERM DIFFERENCES IN COGNITIVE AND LANGUAGE ABILITY AFTER EXPOSURE TO SURGERY AND ANESTHESIA IN INFANCY**
- **AUTHORS:** C . Ing,1 C . DiMaggio,1 A . Whitehouse,2 M . Hegarty,3 A . Davidson,4 L . Y . Sun1
- A history of anesthesia/surgery before age 3 was associated with an increased risk of clinical language impairment between 1.7 to 2.5 fold and abstract reasoning of 3.4 fold
- Controlled for gender, birth weight, APGR, race family income and paternal presence at home

Abstracts from IARS 2011

- Wise-Faberowski et al: Volatile versus narcotic anesthetic for surgical repair of congenital heart disease: the effect on postoperative EEG--Infants undergoing surgical repair for CHD have an 85% risk of an abnormal postoperative EEG, abnormalities being diffuse or localized to the right temporal lobe region and are not seizure activity. A narcotic-based anesthetic technique seems to pose less risk for abnormal EEG findings.
- Moran et al. Excitatory and epileptiform EEG activity in human neonates during sevoflurane-based anesthesia--Some neonates undergoing a general anesthetic with sevoflurane have excitatory and even epileptiform EEG activity.
-

Anesthesia and Outcome After Neonatal Surgery.

- Davidson et. al Dec 2008.—GAS study is ongoing
 - Multi-center study of infants undergoing hernia repair randomized to general vs spinal anesthesia
 - At least 598 infants
 - Outcome: IQ at age 5

Selected Abstracts from SMART Tots 2011

- Creagh et al. Early exposure to anesthesia during cesarean delivery as a factor predisposing to autism spectrum disorder: a population based cohort study
 - Early exposure to anesthesia during cesarean delivery is not associated with the development of autism spectrum disorder
- Flick et al. Exposure to anesthesia and attention deficit hyperactivity disorder
 - Exposure to anesthesia is a significant risk factor for development of attention deficit hyperactivity disorder (ADHD) in children receiving multiple, but not single, anesthetics before age 2 y

Recent abstracts

- Flick et.al-2 or more anesthetic exposures before age 5 may be associated with specific language and math difficulties-detailed records
- Sun et.al-anesthetic prior to age 3 may have an association with learning problems-Medicaid records
- All concede the difficult in differentiating anesthetic effect from underlying medical condition and surgery

Table 3. Summary of Abstracts Presented at SmartTots: Pediatric Neurotoxicity International Anesthesiologists Society (IAS) Annual Meeting

Author	Title	Main Findings
Ungert et al.	Early exposure to anesthesia during emergence delays in early language in children with Down syndrome or preterm-born children	Early exposure to anesthesia during emergence delays in early language in children with Down syndrome or preterm-born children
Casale	Neonatal anesthesia does not result in fetal neurotoxicity: lessons from ethanol exposure	The pattern of neurotoxicity suggests that early exposure of rats equivalent to the preemersion and emergence delays have not been associated with fetal neurotoxicity. Results of ethanol exposure suggest a protective effect against neurotoxicity of differential embryonic cells and neurotoxicity. Early exposure of neonates and preterm-born children and ongoing differentiation and migration in the dentate gyrus of young rats.
Prosser et al.	Prevalence of neurotoxicity associated with neurotoxic differentiation and migration in the dentate gyrus of young rats	Prevalence of neurotoxicity associated with neurotoxic differentiation and migration in the dentate gyrus of young rats
Huh et al.	Prevalence of neurotoxicity associated with neurotoxic differentiation and migration in the dentate gyrus of young rats	Prevalence of neurotoxicity associated with neurotoxic differentiation and migration in the dentate gyrus of young rats
Ng et al.	Quantification of anesthetic exposure by a data abstraction system in the Pediatric Anesthesia Neurodevelopmental Assessment (PANDA) study	The methodology used in the PANDA study, which aims to quantify anesthetic exposure, could be used for other studies and would allow for comparative analysis between studies, and in the evaluation of differences in anesthetic practice among institutions, and potentially lead to the identification of high-anesthetic-exposure areas in specific areas of practice. Exposure elicited by desflurane was equivalent to saline, whereas nitrous oxide decreased neurodevelopment in its neurotoxicity studies, compared with saline. Nitrous oxide was identified as a neurotoxic agent in its neurotoxicity studies.
Mansfield et al.	Neonatal anesthesia does not result in fetal neurotoxicity: comparison to desflurane	Neonatal anesthesia does not result in fetal neurotoxicity: comparison to desflurane
Paidl et al.	Prevalence of neurotoxicity associated with neurotoxic differentiation and migration in the dentate gyrus of young rats	Prevalence of neurotoxicity associated with neurotoxic differentiation and migration in the dentate gyrus of young rats
Conner et al.	Toxic effects of 5-HT _{2A} receptor activation on neurotoxic differentiation and migration in the dentate gyrus of young rats	Toxic effects of 5-HT _{2A} receptor activation on neurotoxic differentiation and migration in the dentate gyrus of young rats
Walker et al.	Assessing neural apoptosis, neurotoxicity, and long-term outcomes following ethanol anesthesia in neonatal rats	Assessing neural apoptosis, neurotoxicity, and long-term outcomes following ethanol anesthesia in neonatal rats

CaMKII - Ca²⁺/calmodulin-dependent protein kinase II; NMDA - human embryonic stem cells; eGFP - eGFP-neurotoxic receptor activation; SOX2 - SOX2 knockdown.

Should we wait to anesthetize infants and young children for elective procedures?

Elective procedures and anesthesia in children: pediatric surgeons enter the dialogue on neurotoxicity questions, surgical options, and parental concerns.
Byrne MW, Ascherman JA, Casale P, Cowles RA, Gallin PF, Maxwell LG. J Neurosurg Anesthesiol. 2012 Oct;24(4):396-400

Duration of exposure to cranial vault surgery: associations with neurodevelopment among children with single-suture craniosynostosis.
Naumann HL, Haberkern CM, Pietila KE, Birgfeld CB, Starr JR, Kapp-Simon KA, Hopper RA, Speltz ML. Paediatr Anaesth. 2012 Apr 16.

Maternal anesthesia and fetal neurodevelopment.

Palanisamy A. Int J Obstet Anesth. 2012 Apr;21(2):152-62

Cognitive and behavioral outcomes after early exposure to anesthesia and surgery.

Flick RP, Katusic SK, Colligan RC, Wilder RT, Voigt RG, Olson MD, Sprung J, Weaver AL, Schroeder DR, Warner DO. Pediatrics. 2011 Nov;128(5):e1053-61.

Sevoflurane Anesthesia in Pregnant Mice Induces Neurotoxicity in Fetal and Offspring Mice.

Zheng H, Dong Y, Xu Z, Crosby G, Culley DJ, Zhang Y, Xie Z. Anesthesiology. 2013 Jan 9.

Newly Postulated Neurodevelopmental Risks of Pediatric Anesthesia: Theories That Could Rock Our World.

Hays SR, Deshpande JK. J Urol. 2012 Nov 20.

SmartTots: a public-private partnership between the United States Food and Drug Administration (FDA) and the International Anesthesia Research Society (IARS).

Ramsay JG, Roizen M. Paediatr Anaesth. 2012 Oct;22(10):969-72

Neurotoxicity and the Need for Anesthesia in the Newborn

Does the Emperor Have No Clothes?



Neurotoxicity and the need for anesthesia in the newborn: does the emperor have no clothes?

Davidson AJ. Anesthesiology. 2012 Mar;116(3):507-9.

“regardless of whether or not sevoflurane causes any clinically relevant toxicity, is it time to question the mantra that all babies need a hypnotic agent such as sevoflurane?”

Long-term differences in language and cognitive function after childhood exposure to anesthesia.
 Ing C, DiMaggio C, Whitehouse A, Hegarty MK, Brady J, von Ungern-Sternberg BS, Davidson A, Wood AJ, Li G, Sun LS.
Pediatrics. 2012 Sep;130(3):e476-85

Lithium attenuates bupivacaine-induced neurotoxicity in vitro through phosphatidylinositol-3-kinase/threonine-serine protein kinase B- and extracellular signal-regulated kinase-dependent mechanisms.
 Wang Z, Shen J, Wang J, Lu T, Li C, Zhang X, Liu L, Ding Z.
 Neuroscience. 2012 Mar 29;206:190-200

Neurologic outcomes in very preterm infants undergoing surgery.
 Filan PM, Hunt RW, Anderson PJ, Doyle LW, Inder TE.
 J Pediatr. 2012 Mar;160(3):409-14

- We don't know
- Millions of children have been anesthetized over the years with few obvious problems
- Few procedures in the very young are truly elective

Pre-op Anxiety

Streamed Video Clips to Reduce Anxiety in Children During Inhaled Induction of Anesthesia
 Katherine A. Millin, USC (Hons),**†† Thomas Hackbarth, MD, IHLPI, ILS and Jill MacLaren-Chorney, PhD, HPsych††

BACKGROUND: Anesthesia induction in children is frequently followed by inhalation of nitrous oxide and sevoflurane. Ineffective nonpharmacologic nonverbal distraction techniques such as humor or nonverbal talk to reduce anxiety and facilitate a smooth transition of the child to asleep. There is a large body of anecdotal evidence to suggest that exposure to the use of video and relaxation distraction methods for minor medical and dental procedures, but little research on the use of these methods for ambulatory surgery. In this randomized control trial study we assess what whether video distraction is effective in reducing the anxiety of children undergoing inhaled induction before ambulatory surgery.

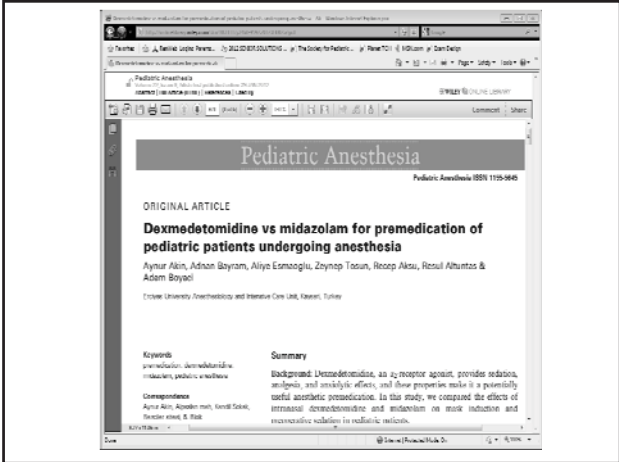
METHODS: Children (ages = 4†, n=42) between 2 and 10 years old undergoing ambulatory surgery were randomly assigned to a video distraction or control group. In the video distraction group a video clip of the child's preference was played during induction, and the control group received traditional distraction methods during induction. The modified Yale Preoperative Anxiety Scale was used to assess the children's anxiety before and during the process of inhaled induction anesthesia.

RESULTS: All children were similar in their age and anxiety scores before entering the operating room. Children in the video distraction group were significantly less anxious at induction and showed a significantly smaller change in anxiety from holding to induction than did children in the control group.

CONCLUSIONS: Having video clips during the inhaled induction of children undergoing ambulatory surgery is an effective method of reducing anxiety. Therefore, pediatric unpharmacologic may consider using video distraction as a useful, valid, alternative strategy for achieving a smooth transition to the anesthetized state. (Pediatr Anesth 2012;12:1162-7)

†† separation from parents, fear or exposure to a foreign environment may show further procedures and with repeated exposure may show

- **Cartoon Distraction Alleviates Anxiety in Children During Induction of Anesthesia**
- Jeongwoo Lee, MD,* Jihye Lee, MD,* Hyungsun Lim, MD,† Ji-Seon Son, MD, PhD,‡ Jun-Rae Lee, MD, PhD,‡ Dong-Chan Kim, MD, PhD,† and Seonghoon Ko, MD, PhD§
- (Anesth Analg 2012;115:1168–73)

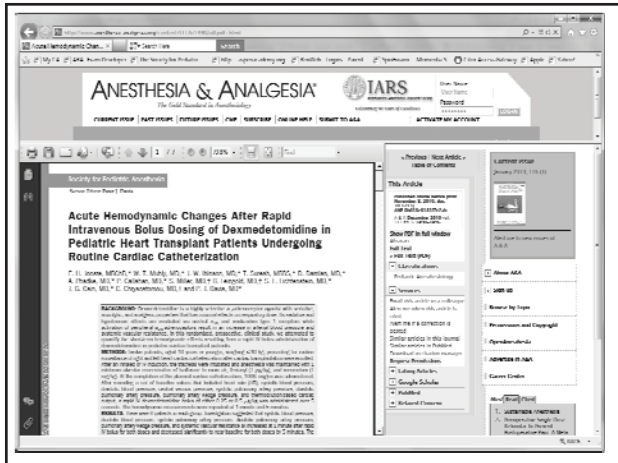


- ### Fasting ???
- Paediatr Anaesth, 2012 Sep;22(9):897-900. doi: 10.1111/j.1460-9592.2012.03903.x. Epub 2012 Jun 25.
 - **Parents' understanding of and compliance with fasting instruction for pediatric day case surgery.**
 - Cantello S, Lightfoot J, Bould H, Beringer R.
 - During the fasting period, 4.9% would allow French fries, 22.3% toast/crackers, 17.5% cereal, 14.7% a sweet, 14.9% gum, and 12.6% tea with milk.

- ### The 10 most frequently asked questions listed in order of frequency among responders
- What is the clinical relevance of neurotoxicity of general anesthetics?
 - Does regional blockade improve outcome in children?
 - What is the best anesthetic management for children with pulmonary hypertension?
 - How do we eliminate emergence agitation?
 - What is the optimal intravenous fluid?
 - How do pharmacokinetics and pharmacodynamics change with age?
 - What is the optimal sedation and analgesia in pediatric intensive care?
 - How do we optimize post discharge pain management?
 - How can we use pharmacogenetic information in children?
 - What are the long-term consequences of opioid use in children and how can we reduce the side effects of opioids?
- Pediatric Anesthesia
22 (2012) 613–615

- ### Dexmedetomidine Wonder Drug???
- Efficacy and safety of intraoperative dexmedetomidine for acute postoperative pain in children: a meta-analysis of randomized controlled trials. Schnabel A, Reichl SU, Poepping DM, Kranke P, Pogatzki-Zahn EM, Zahn PK. Paediatr Anaesth. 2013 Feb;23(2):170-9.
 - Comparison of buccal and nasal dexmedetomidine premedication for pediatric patients. Cimen ZS, Hanci A, Sivrikaya GU, Kilinc LT, Erol MK. Paediatr Anaesth. 2013 Feb;23(2):134-8. doi: 10.1111/pan.12025. Epub 2012 Sep 18.

- ### Dexmedetomidine
- Potent α_2 agonist, sedation and analgesia
 - Being found to be very useful in children for a variety of conditions
 - MRI
 - Sleep endoscopy
 - Premedication
 - PICU sedation
 - Awake intubation
 - ??? Neuroprotective



Dexmedetomidine and OSA

- 2 studies looking at dex in patients undergoing T&A
 - 1ug/kg dex ≈ 100ug/kg morphine
 - No adverse events
 - 2ug/kg bolus + 0.7ug/kg infusion of dex compared to fentanyl 1ug/kg
- reduced opioid requirements, less emergence agitation, and fewer episodes of desaturation

Anesth Analg. 2010 Oct;111(4):1004-10
Anesth Analg. 2010 Aug;111(2):490-5

Effects on Upper Airway

- Mahmoud M, et al Paediatr Anaesth. 2010 Jun;20(6):506-15.
- 23 patients received low (1ug/kg) or high (3ug/kg) for MRI sedation
- Minimal changes in upper airway morphology with dex sedation detected on MRI

Intranasal Dexmedetomidine

- Yuen, et al in a series of studies have found 1 mug/kg intranasal dexmedetomidine to be effective in producing sedation in children at ~ 30 minutes, effects lasting for ~ 80 minutes.

A Comparison of Intranasal Dexmedetomidine and Oral Midazolam for Premedication in Pediatric Anesthesia: A Double-Blinded Randomized Controlled Trial. A&A Vol. 106, No. 6, June 2008

Other Uses

- Decreases incidence of emergence agitation
- As an adjunct to decrease N&V
- Minimal effects on SSEP and MEP's, therefore may be used for spine surgery

Dexmedetomidine: perioperative applications in children. Yuen VM. Paediatr Anaesth. 2010 Mar;20(3):256-64

Other Uses

- Sleep endoscopy-used to simulate sleep for better evaluation of OSA
- Sole or in combination for MRI/CT scan sedation
- Electrocardiography, challenging medical conditions
- Awake craniotomies
- Sedation in multiple locations and for multiple procedures

Side Effects

- Bradycardia and occasionally arrest
- Depresses Av and SA node conduction
- Hypertension with rapid boluses
- Hypo or hypertension (with repeated boluses)
- May be neuroprotective or at least not destructive

Ketodex, a combination of dexmedetomidine and ketamine for upper gastrointestinal endoscopy in children: a preliminary report.

Goyal R, Singh S, Shukla RN, Patra AK, Bhargava DV. J Anesth. 2012 Dec 9.

Dexmedetomidine controls junctional ectopic tachycardia during Tetralogy of Fallot repair in an infant.

LeRiger M, Naguib A, Gallantowicz M, Tobias JD. Ann Card Anaesth. 2012 Jul-Sep;15(3):224-8.

Spinal anesthesia is a valid alternative to other anesthetic approaches for children with neuromuscular disease, and dexmedetomidine sedation is a safe method for pediatric regional anesthesia.

Sener M. Paediatr Anaesth. 2012 Jun;22(6):597-8.

Dexmedetomidine sedation: uses in pediatric procedural sedation outside the operating room.

McMorrow SP, Abramo TJ. Pediatr Emerg Care. 2012 Mar;28(3):292-6.

Perioperative use of dexmedetomidine is associated with decreased incidence of ventricular and supraventricular tachyarrhythmias after congenital cardiac operations. Chrysostomou C, Sanchez-de-Toledo J, Wearden P, Jooste EH, Lichtenstein SE, Callahan PM, Suresh T, O'Malley E, Shiderly D, Haney J, Yoshida M, Orr R, Munoz R, Morell VO. Ann Thorac Surg. 2011 Sep;92(3):964-72; discussion 972

The effect of dexmedetomidine during myringotomy and pressure-equalizing tube placement in children.

Pestieau SR, Quezado ZM, Johnson YJ, Anderson JL, Cheng YI, McCarter RJ, Pena MT, Finkel JC. Paediatr Anaesth. 2011 Nov;21(11):1128-35

Dexmedetomidine use in pediatric airway reconstruction.

Silver AL, Yager P, Purohit P, Noviski N, Hartnick CJ. Otolaryngol Head Neck Surg. 2011 Feb;144(2):262-7

Dexmedetomidine infusion for analgesia and prevention of emergence agitation in children with obstructive sleep apnea syndrome undergoing tonsillectomy and adenoidectomy.

Patel A, Davidson M, Tran MC, Quraishi H, Schoenberg C, Sant M, Lin A, Sun X. Anesth Analg. 2010 Oct;111(4):1004-10

The effect of intraoperative dexmedetomidine on postoperative analgesia and sedation in pediatric patients undergoing tonsillectomy and adenoidectomy.

Olutoye OA, Glover CD, Diefenderfer JW, McGilberry M, Wyatt MM, Larrier DR, Friedman EM, Watcha MF. Anesth Analg. 2010 Aug;111(2):490-5.

Dexmedetomidine use in pediatric airway reconstruction.

Silver AL, Yager P, Purohit P, Noviski N, Hartnick CJ. Otolaryngol Head Neck Surg. 2011 Feb;144(2):262-7

The comparison of the effects of dexmedetomidine and midazolam sedation on electroencephalography in pediatric patients with febrile convulsion.

Aksu R, Kumandas S, Akin A, Bicer C, Gümüş H, Güler G, Per H, Bayram A, Boyacı A. Paediatr Anaesth. 2011 Apr;21(4):373-8.

High-dose dexmedetomidine sedation for pediatric MRI.

Siddappa R, Riggins J, Kariyanna S, Calkins P, Rotta AT. Paediatr Anaesth. 2011 Feb;21(2):153-8.

•Ilan Keidan, Erez Ben-Menachem, Sno Ellen White, and Haim Berkenstadt
Intravenous Sodium Bicarbonate Verifies Intravenous Position of Catheters in Ventilated Children *Anesth. Analg.* 2012 115:909-912

It is a common clinical problem to be presented with a pediatric patient with IV access for which there is doubt about the usability of the catheter. Vascular access is often bandaged, obscuring clinical assessment, children may not be capable of verbally communicating pain at injection sites, and a "twiddler's syndrome" has been described in which the child manipulates the catheter, causing it to migrate out of the vessel.⁴ Additionally, fluid leakage into surrounding tissue may initially go unnoticed owing to the distensibility of subcutaneous tissues in the very young.

Pain

Pernille Lykke Petersen, Pia Stjernholm, Viggo B. Kristiansen, Henrik Torup, Egon G. Hansen, Anja U. Mitchell, Ann Moeller, Jacob Rosenberg, Joergen B. Dahl, and Ole Mathiesen
The Beneficial Effect of Transversus Abdominis Plane Block After Laparoscopic Cholecystectomy in Day-Case Surgery: A Randomized Clinical Trial *Anesth. Analg.* 2012 115:527-5331

TAP block after laparoscopic cholecystectomy may have some beneficial effect in reducing pain while coughing and on opioid requirements, but this effect is probably rather small

Helena K. Hippard, Kalyani Govindan, Ellen M. Friedman, Marcelle Sulek, Carla Giannoni, Deidre Larrier, Charles G. Minard, and Mehernoor F. Watcha
Postoperative Analgesic and Behavioral Effects of Intranasal Fentanyl, Intravenous Morphine, and Intramuscular Morphine in Pediatric Patients Undergoing Bilateral Myringotomy and Placement of Ventilating Tubes *Anesth. Analg.* 2012 115:356-363

One hundred seventy-one ASA physical status I and II children scheduled for BMT were randomized into 1 of 3 groups: group 1—nasal fentanyl 2 µg/kg with IV and IM saline placebo; group 2—IV morphine 0.1 mg/kg with nasal and IM placebo; or group 3—IM morphine 0.1 mg/kg with nasal and IV placebo

RESULTS: There were no significant differences in peak FLACC pain among the 3 groups

Postoperative Data
 FLACC = Faces, Legs, Activity, Cry, and Consolability; IQR = interquartile range; PAED = Pediatric Anesthesia Emergence Delirium.
 ... Treatment groups were compared using the Kruskal-Wallis test for continuously measured variables and the Fisher exact test for categorical variables.

	HS	SZ	Sp	
Maximum FLACC score				
Mean ± SD	2.0 ± 2.7	2.7 ± 3.2	2.9 ± 3.0	0.21
Median (IQR)	0 (3.5)	2.0 (4.5)	3.0 (4.0)	
Maximum PAED score				
Mean ± SD	4.6 ± 5.8	6.3 ± 6.7	6.1 ± 6.2	0.34
Median (IQR)	1.5 (9)	4.0 (13)	5.0 (11)	
Emergence delirium, n (%)				
PAED score ≥12	7 (14.6%)	14 (26.9%)	12 (21.4%)	0.33
Rescue medication, n (%)				
Acetaminophen	15 (37.0%)	20 (38.5%)	24 (42.9%)	0.81
Morphine	3 (6.3%)	3 (5.8%)	3 (5.4%)	
Ondansetron	0 (0%)	1 (2%)	0 (0%)	

•Olutoyin A. Olutoye, et. al **The Effect of Obesity on the ED₅₀ of Propofol for Loss of Consciousness in Children and Adolescents** *Anesth. Analg.* 2012 115:147-153

Table 2.
 Nonobese: Observed and Pooled-Adjacent-Violators Algorithm (PAVA)-Adjusted Response Rates with Propofol (Isotonic Regression Method)

Assigned dose (mg/kg)	Trials (n)	Number of patients tested at assigned dose	Observed response rate	PAVA-adjusted response rate
1.0	0	1	0	0
1.25	0	1	0	0
1.5	4	6	0.667	0.667
1.75	9	10	0.900	0.714
2.0	1	2	0.500	0.714
2.25	0	1	0	0.714
2.5	0	1	0	0.714
2.75	9	11	0.818	0.813
3.0	4	5	0.800	0.813
3.25	2	2	1	1

Ketamine the old wonder drug

The evolution of ketamine applications in children.

Roelofse JA.
Paediatr Anaesth. 2010 Mar;20(3):240-5.

Ketamine has found many applications in pediatric anesthetic practice. Insights into the mechanism of action and the pharmacokinetics and pharmacodynamics of its isomers have led to a re-evaluation of this drug, expanding the range of applications in children. Ketamine is a remarkably versatile drug that can be administered through almost any route. It can also be used for different purposes.

Prevention of propofol-induced pain in children: pretreatment with small doses of ketamine.

Zhao GY, Guo Y, Bao SM, Meng LX, Zhang LH.
J Clin Anesth. 2012 Jun;24(4):284-8.

0.3 mg/kg helps decrease pain on injection

Ketamine for perioperative pain management in children: a meta-analysis of published studies.

Dahmani S, Michelet D, Abback PS, Wood C, Brasher C, Nivoche Y, Mantz J. Paediatr Anaesth. 2011 Jun;21(6):636-52.

Most studies show improvement in pain scores and or less opioid consumption in first 24 hours
No long term studies

Paediatr Anaesth. 2012 Jul;22(7):669-75. doi: 10.1111/j.1460-9592.2012.03844.x. Epub 2012 Apr 4.

Is ethnicity associated with morphine's side effects in children? Morphine pharmacokinetics, analgesic response, and side effects in children having tonsillectomy.

Jimenez N, Anderson GD, Shen DD, Nielsen SS, Farin FM, Seidel K, Lynn AM.

J Opioid Manag. 2012 Jul-Aug;8(4):217-26. doi: 10.5055/jom.2012.0119.

Morphine clearance in children: does race or genetics matter?

Sadhasivam S, Krekels EH, Chidambaran V, Esslinger HR, Ngamprasertwong P, Zhang K, Fukuda T, Vinks AA.

Source

Department of Anesthesia, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio, USA.

Pediatrics. 2012 May;129(5):832-8. doi: 10.1542/peds.2011-2607. Epub 2012 Apr 23.

Race and unequal burden of perioperative pain and opioid related adverse effects in children.

Sadhasivam S, Chidambaran V, Ngamprasertwong P, Esslinger HR, Prows C, Zhang X, Martin LJ, McAuliffe J.

•David R. Drover,
•Gregory B. Hammer,
•and Brian J. Anderson

The Pharmacokinetics of Ketorolac After Single Postoperative Intranasal Administration in Adolescent Patients Anesth. Analg. 2012 114:1270-1276

Results in adolescents are presented as results for a 70-kg person to allow comparison with adult parameters reported by others.^{3,2} Our study demonstrates that the PK of intranasal ketorolac in adolescents is similar to those reported in adults, assuming use of the same nasal administration device. Administration of ketorolac by the intranasal route resulted in a rapid increase in plasma concentration and may be a useful therapeutic alternative to IV injection in adolescents because plasma concentrations attained with the device are likely to be analgesic.

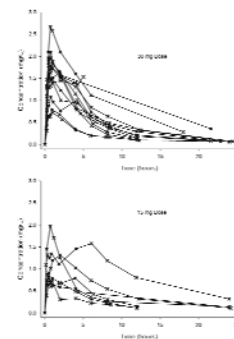
Picture of the intranasal ketorolac delivery device.



Drover D R et al. Anesth Analg 2012;114:1270-1276

ANESTHESIA & ANALGESIA

Individual observed plasma ketorolac concentration profiles are shown for the 30-mg dose (upper panel) and the 15-mg dose (lower panel).



Drover D R et al. Anesth Analg 2012;114:1270-1276

ANESTHESIA & ANALGESIA