



ON THE COVER:

Residual postoperative paralysis from nondepolarizing neuromuscular blocking agents is a known problem. This paralysis has been associated with impaired respiratory function. In this issue of *ANESTHESIOLOGY*, Bulka *et al.* demonstrate that intraoperative use of intermediate neuromuscular blocking agents is associated with developing pneumonia after surgery. Those patients that receive these agents but do not receive reversal agents have an associated increased risk of postoperative pneumonia.

- Bulka *et al.*: Nondepolarizing Neuromuscular Blocking Agents, Reversal, and Risk of Postoperative Pneumonia, p. 647
- Murphy and Kopman: “To Reverse or Not to Reverse?” The Answer Is Clear!, p. 611

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This article has an Audio Podcast



This is a Healthcare Redesign article



See Supplemental Digital Content



CME Article



This article has a Video Abstract

- Michael M. Todd, M.D., Recipient of the 2016 Excellence in Research Award** 641
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- Hannah Wunsch, M.D., M.Sc., Recipient of the 2016 Presidential Scholar Award** 645
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■ PERIOPERATIVE MEDICINE

CLINICAL SCIENCE

- ◆◆ **Nondepolarizing Neuromuscular Blocking Agents, Reversal, and Risk of Postoperative Pneumonia** 647



C. M. Bulka, M. A. Terekhov, B. J. Martin, R. R. Dmochowski, R. M. Hayes, and J. M. Ehrenfeld

The incidence of pneumonia in patients receiving a neuromuscular blocking agent was 1.79 times that of propensity-matched patients who did not receive a neuromuscular blocking agent. The incidence of pneumonia in patients receiving a neuromuscular blocking agent without reversal of neuromuscular blockade with neostigmine was 2.26 times that of propensity-matched cases who received reversal with neostigmine.

- CME ◆◆ **Success of Intubation Rescue Techniques after Failed Direct Laryngoscopy in Adults: A Retrospective Comparative Analysis from the Multicenter Perioperative Outcomes Group** 656
- M. F. Aziz, A. M. Brambrink, D. W. Healy, A. W. Willett, A. Shanks, T. Tremper, L. Jameson, J. Ragheb, D. A. Biggs, W. C. Paganelli, J. Rao, J. L. Epps, D. A. Colquhoun, P. Bakke, and S. Kheterpal*

This is an analysis of the techniques used after direct laryngoscopy fails. Video laryngoscopy has become the preferred rescue technique, and its use is associated with a higher intubation success rate than other rescue techniques.

- ◆🌐 **Neurodevelopmental Assessment in Kindergarten in Children Exposed to General Anesthesia before the Age of 4 Years: A Retrospective Matched Cohort Study** 667

M. R. Graham, M. Brownell, D. G. Chateau, R. D. Dragan, C. Burchill, and R. R. Fransoo

In a Canadian retrospective cohort review of 3,850 children exposed to a single general anesthetic, 620 exposed to two or more, and over 13,000 nonexposed children, there was no association between anesthesia at age less than 2 yr and the Early Development Instrument assessment. In children between 2 and 4 yr of age, single and multiple anesthetic exposures were associated with decreases in the Early Development Instrument score although this might have related to confounding.

- Impact of a Potassium-enriched, Chloride-depleted 5% Glucose Solution on Gastrointestinal Function after Major Abdominopelvic Surgery: Results of a Randomized Controlled Trial** 678

L. M. Löffel, F. C. Burkhard, J. Takala, and P. Y. Wuethrich

The primary outcome, time to first defecation, did not differ significantly.

- ◆ **Intraoperative Care Transitions Are Not Associated with Postoperative Adverse Outcomes** 690

M. A. Terekhov, J. M. Ehrenfeld, R. P. Dutton, O. D. Guillaumondegui, B. J. Martin, and J. P. Wanderer

In a review of over 100,000 anesthetics at Vanderbilt University, anesthesia care transitions were not associated with increased 30-day mortality or a composite morbidity outcome. Short breaks were associated with a small (less than 7%) reduction in these outcomes.

- ◆ **Sedation with Dexmedetomidine or Propofol Impairs Hypoxic Control of Breathing in Healthy Male Volunteers: A Nonblinded, Randomized Crossover Study** 700

Å Lodenius, A. Ebberlyd, A. H. Cedborg, E. Hagel, S. Mkrtchian, E. Christensson, J. Ullman, M. Scheinin, L. I. Eriksson, and M. J. Fagerlund

In this randomized crossover healthy volunteer study, sedation with dexmedetomidine and propofol significantly reduced hypoxic ventilation to 59 and 53% and the hypercapnic ventilation to 82 and 86%, respectively. Clinicians should recognize respiratory-depressant effects of dexmedetomidine.

A Practical Training Program for Peripheral Radial Artery Catheterization in Adult Patients: A Prospective, Randomized Controlled Trial 716

Y. Nakayama, Y. Inagaki, Y. Nakajima, D. I. Sessler, N. Mukai, S. Ogawa, T. Mizobe, and T. Sawa

Using data from radial artery ultrasound in 350 adults, a training program for palpation-guided catheterization was devised; completion of this program resulted in shorter insertion time (56 ± 2 vs. 109 ± 2 s) and greater success (83 of 100 vs. 57 of 100 attempts) versus controls.

◇ **Anesthesia Technique and Mortality after Total Hip or Knee Arthroplasty: A Retrospective, Propensity Score-matched Cohort Study** 724

A. Perlas, V. W. S. Chan, and S. Beattie

In the matched cohort, 30-day mortality rate was 0.19% ($n = 4$) for those receiving spinal anesthesia and 0.8% ($n = 17$) for those receiving general anesthesia (risk ratio, 0.42; 95% CI, 0.21 to 0.83; $P = 0.0045$). There was an association between spinal anesthesia and lower 30-day mortality.

BASIC SCIENCE

Preclinical Pharmacology of CW002: A Nondepolarizing Neuromuscular Blocking Drug of Intermediate Duration, Degraded and Antagonized by L-cysteine—Additional Studies of Safety and Efficacy in the Anesthetized Rhesus Monkey and Cat 732

H. Sunaga, J. J. Savarese, J. D. McGilvra, P. M. Heerdt, M. R. Belmont, S. G. Van Ornum, M. T. Murrell, J. K. Malhotra, P. M. Savard, E. Jeannotte, B. J. Petty, E. Allen, and G. W. Carnathan

L-cysteine caused rapid recovery of twitch from 5 to 95% of baseline within 1.8 to 3.6 min when it was administered to monkeys 1 min after doses of CW002 ranging from approximately 3.75 to 10 times the dose producing 95% twitch suppression (ED95; 0.15 to 0.40 mg/kg). The ratios of the doses producing a 20% decrease of mean arterial pressure or a 20% increase in heart rate in monkeys to the ED95 for neuromuscular blockade were $27 \times$ ED95 and $54 \times$ ED95, respectively.

■ CRITICAL CARE MEDICINE

BASIC SCIENCE

◆ **Effects of Different Crystalloid Solutions on Hemodynamics, Peripheral Perfusion, and the Microcirculation in Experimental Abdominal Sepsis** 744

D. Orbegozo, F. Su, C. Santacruz, X. He, K. Hosokawa, J. Creteur, D. De Backer, and J.-L. Vincent

In a comparison of normal saline, Ringer's lactate, and PlasmaLyte as resuscitation fluids in a large animal model of abdominal peritonitis and sepsis, normal saline was associated with more adverse side effects (acidosis, hemodynamic instability, altered microcirculation, and organ dysfunction) than the balanced solutions.

■ PAIN MEDICINE

BASIC SCIENCE

◆ **Opioid-induced Loss of Local Anesthetic Potency in the Rat Sciatic Nerve** 755

Q. Liu and M. S. Gold

In rats, seven daily injections of morphine resulted in analgesic tolerance *in vivo* and a reduction in potency of nerves *in vitro* of lidocaine to block the compound action potential. Although analgesic efficacy to morphine recovered, this loss of lidocaine potency remained 35 days after the last morphine injection.

◆ **Contribution of the Suppressor of Variegation 3-9 Homolog 1 in Dorsal Root Ganglia and Spinal Cord Dorsal Horn to Nerve Injury-induced Nociceptive Hypersensitivity** 765

J. Zhang, L. Liang, X. Miao, S. Wu, J. Cao, B. Tao, Q. Mao, K. Mo, M. Xiong, B. M. Lutz, A. Bekker, and Y.-X. Tao

Using the spinal nerve ligation model of neuropathic pain, the authors observed down-regulation of μ -opioid receptor in conjunction with allodynia and hyperalgesia. Reducing the activity or expression of the histone methyltransferase SUV39H1 using chaetocin or siRNA, μ -opioid receptor expression was increased in the spinal nerve ligation animals, and nociceptive sensitization was reduced.

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Using an animal model of bone cancer–induced pain, it was shown that the γ -aminobutyric acid receptor type A agonist muscimol when injected into the anterior cingulate cortex (ACC) could reduce nociceptive sensitization in tumor-bearing mice. Using optogenetic techniques and engineered receptors to reciprocally regulate the activity of ACC neurons, it was shown that the ACC may regulate nociceptive signaling at the level of the spinal cord.

Raman Spectroscopy Differentiates Each Tissue from the Skin to the Spinal Cord: A Novel Method for Epidural Needle Placement? 793



T. A. Anderson, J. W. Kang, T. Gubin, R. R. Dasari, and P. T. C. So

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