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These practice guidelines update the Practice Guidelines for Central Venous Access: A Report by the American Society of Anesthesiologists Task Force on Central Venous Access, adopted by the American Society of Anesthesiologists in 2011 and published in 2012. These updated guidelines are intended for use by anesthesiologists and individuals under the supervision of an anesthesiologist and may also serve as a resource for other physicians, nurses, or healthcare providers who manage patients with central venous catheters. *SUPPLEMENTAL DIGITAL CONTENT IS AVAILABLE IN THE TEXT*

## Special Article

### ◆ International Policy Frameworks for Consent in Minimal-risk Pragmatic Trials

*T. J. Symons, N. Zeps, P. S. Myles, J. M. Morris, D. I. Sessler*..... 44

There is intense interest in the most appropriate consent models for pragmatic comparative effectiveness trials. This article reviews the extent to which policy frameworks in three countries support these important trials. *SUPPLEMENTAL DIGITAL CONTENT IS AVAILABLE IN THE TEXT*

### ◆ Perioperative Neurocognitive Disorder: State of the Preclinical Science

*R. G. Eckenhoff, M. Maze, Z. Xie, D. J. Culley, S. J. Goodlin, Z. Zuo, H. Wei, R. A. Whittington, N. Terrando, B. A. Orser, M. F. Eckenhoff* ..... 55

A bewildering variety of preclinical postoperative cognitive dysfunction studies has been reported over the last two decades. Herein the authors succinctly summarize the approaches and models, some of the accrued knowledge, and suggestions for future design and reporting.

## Readers' Toolbox

### Novel Clinical Trial Designs to Improve the Efficiency of Research

*D. I. Sessler, P. S. Myles*..... 69

Novel trial designs, some with waived or modified patient consent, are increasingly being used to answer research questions more efficiently. Modifications to conventional trial designs that introduce flexibility and efficiency are also becoming more common.

## Perioperative Medicine

### CLINICAL SCIENCE

### ◆ Deficit Accumulation and Phenotype Assessments of Frailty Both Poorly Predict Duration of Hospitalization and Serious Complications after Noncardiac Surgery

*A. Sonny, A. Kurz, L. A. Skolaris, L. Boehm, A. Reynolds, K. C. Cummings III, N. Makarova, D. Yang, D. I. Sessler* ..... 82

The Hopkins Frailty Score (a phenotype model) and the Modified Frailty Index score (a measure of deficit accumulation) were both poor predictors of unexpected prolonged hospital stay and a composite of readmission and serious complications.

◆ Refers to This Month in ANESTHESIOLOGY

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This article has a Video Abstract

Part of the Letheon writing competition

This article has a Visual Abstract



Readers' Toolbox



**ON THE COVER:** Compassionate behavior is at the core of the medical profession: seeking to understand patients' psychosocial, physical, and medical needs; timely attendance to those needs; and involving patients as they desire. In this issue of ANESTHESIOLOGY, Waisel *et al.* evaluated compassionate behavior of anesthesia residents in a simulated preoperative encounter with a patient in pain before urgent surgery. Anesthesia residents had variable and, at times, flawed recognition of patient cues, responsiveness to patient cues, pain management, and patient interactions. Cover Illustration: A. Johnson, Vivo Visuals.

- Waisel *et al.*: Compassionate and Clinical Behavior of Residents in a Simulated Informed Consent Encounter, p. 159

# ◇ Fresh Frozen Plasma *versus* Crystalloid Priming of Cardiopulmonary

## 👁 Bypass Circuit in Pediatric Surgery: A Randomized Clinical Trial

A. Dieu, M. Rosal Martins, S. Eeckhoudt, A. Matta, D. Kahn,  
C. Khalifa, J. Rubay, A. Poncelet, A. Haenecour, E. Derycke, D. Thiry,  
A. Gregoire, M. Momeni.....95

In this double-blind randomized controlled trial of patients undergoing pediatric cardiac surgery with cardiopulmonary bypass, postoperative bleeding and need for allogenic blood products does not differ significantly between patients for whom the cardiopulmonary bypass circuit was primed with crystalloid *versus* fresh frozen plasma.

## 🌐 ◇ Propofol and Sevoflurane Differentially Impact MicroRNAs in 👁 Circulating Extracellular Vesicles during Colorectal Cancer Resection: A Pilot Study

D. Buschmann, F. Brandes, A. Lindemann, M. Maerte, P. Ganschow,  
A. Chouker, G. Schelling, M. W. Pfaffl, M. Reithmair.....107

This proof-of-concept study in colorectal cancer patients receiving either propofol (n = 8) or sevoflurane (n = 9) found 64 extracellular vesicle-associated microRNAs to be significantly regulated by total intravenous anesthesia and 33 to be significantly regulated by sevoflurane anesthesia. All microRNAs downregulated in response to anesthesia were anesthetic agent specific, while most upregulated microRNAs were not. Total intravenous anesthesia-regulated microRNAs might mediate inhibitory effects on signaling pathways involving cell proliferation, migration, and epithelial-mesenchymal transition of tumor cell line and enhance effects on apoptosis of carcinoma cell lines. *SUPPLEMENTAL DIGITAL CONTENT IS AVAILABLE IN THE TEXT*

## 🌐 Preoperative Vitamin D Concentration and Cardiac, Renal, and Infectious Morbidity after Noncardiac Surgery

A. Turan, A. S. Artis, C. Hanline, P. Saha, K. Maheshwari, A. Kurz,  
P. J. Devereaux, E. Duceppe, A. Patel, M. Tiboni, K. Ruetzler,  
R. Pearce, M. T. V. Chan, W. K. K. Wu, S. Srinathan, A. X. Garg,  
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Vitamin D deficiency was common in this surgical population. Preoperative vitamin D was not associated with a composite of postoperative 30-day cardiac outcomes. There was an association between low vitamin D and a composite of infectious complications, and also evidence for an association with decreased kidney function. *SUPPLEMENTAL DIGITAL CONTENT IS AVAILABLE IN THE TEXT*

# Critical Care Medicine

## BASIC SCIENCE

## 🌐 ◇ Resuscitation with Hydroxyethyl Starch Maintains Hemodynamic 👁 Coherence in Ovine Hemorrhagic Shock

P.-H. Armemann, M. Hessler, T. Kampmeier, L. Seidel, Y. Malek,  
H. Van Aken, A. Morelli, S. Rehberg, C. Ince, C. Ertmer.....131

In a sheep model of hemorrhagic shock, resuscitation with both saline and hydroxyethyl starch restored mean arterial pressure (macrocirculation). After fluid resuscitation with hydroxyethyl starch, microcirculatory perfused vessel density and microvascular flow index (microcirculation) both improved, while saline only marginally improved microvascular flow index and perfused vessel density decreased further. Resuscitation with hydroxyethyl starch but not saline maintained hemodynamic coherence after hemorrhagic shock. *SUPPLEMENTAL DIGITAL CONTENT IS AVAILABLE IN THE TEXT*

## 🌐 Human Umbilical Cord Mesenchymal Stromal Cells Attenuate Systemic Sepsis in Part by Enhancing Peritoneal Macrophage Bacterial Killing via Heme Oxygenase-1 Induction in Rats

M. Jerkic, S. Gagnon, R. Rabani, T. Ward-Able, C. Masterson,  
G. Otulakowski, G. F. Curley, J. Marshall, B. P. Kavanagh,  
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In a rat model of fecal peritonitis, human umbilical cord mesenchymal stromal cells improved survival and reduced bacterial load by enhancing peritoneal macrophage function partly through induction of macrophage heme oxygenase-1. Lipoxin A4 and prostaglandin E2 were found to play important roles in mediating the effect of human umbilical cord mesenchymal stromal cells on peritoneal macrophage heme oxygenase-1 expression. *SUPPLEMENTAL DIGITAL CONTENT IS AVAILABLE IN THE TEXT*

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## EDUCATION



- ◇ **Compassionate and Clinical Behavior of Residents in a Simulated Informed Consent Encounter**  
*D. B. Waisel, M. A. Ruben, D. Blanch-Hartigan, J. A. Hall, E. C. Meyer, R. H. Blum*.....159

The investigators evaluated compassionate behavior of anesthesia residents in a simulated preoperative encounter with a patient in pain before urgent surgery. Anesthesia residents had variable and, at times, flawed recognition of patient cues, responsiveness to patient cues, pain management, and patient interactions.

## CLINICAL FOCUS REVIEW

- ◇ **Personalizing the Definition of Hypotension to Protect the Brain**  
*K. M. Brady, A. Hudson, R. Hood, B. DeCaria, C. Lewis, C. W. Hogue*.....170

In this review, the authors argue that hypotension is an individual definition not accurately determined based on population data. Monitoring cerebral blood flow autoregulation provides a clinically feasible approach for judging the acceptable intraoperative and intensive care unit blood pressure.

## REVIEW ARTICLE



- ◇ **Perioperative Acute Kidney Injury**  
*S. D. Gumbert, F. Kork, M. L. Jackson, N. Vanga, S. J. Ghebremichael, C. Y. Wang, H. K. Eltzschig*.....180

Acute kidney injury occurs frequently among surgical patients during the perioperative period and can have long-term, detrimental effects on patient outcomes. This review surveys recent progress in the pathophysiologic understanding, detection, prevention, and clinical management of the disease. *SUPPLEMENTAL DIGITAL CONTENT IS AVAILABLE IN THE TEXT*

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