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◇ **Perioperative Management of Patients Infected with the Novel Coronavirus: Recommendation from the Joint Task Force of the Chinese Society of Anesthesiology and the Chinese Association of Anesthesiologists**
 *X. Chen, Y. Liu, Y. Gong, X. Guo, M. Zuo, J. Li, W. Shi, H. Li, X. Xu, W. Mi, Y. Huang, Chinese Society of Anesthesiology Chinese Association of Anesthesiologists*..... 1307

These recommendations on the management of COVID-19 patients are intended to help anesthesiologists provide the best care for patients and to reduce the risk of virus transmission in resource-limited settings in the pandemic.

◇ Refers to This Month in ANESTHESIOLOGY

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 This article has an Audio Podcast

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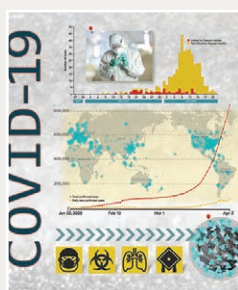
 CME Article

 This article has a Video Abstract

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 Readers' Toolbox



ON THE COVER: In this issue of ANESTHESIOLOGY, a series of Special Articles and Editorials discuss the COVID-19 pandemic and its implications for anesthesiologists. The issue was assembled in early April 2020, during the early stages of evolution of the pandemic in the United States. Chen *et al.* and a group of leaders from the Chinese Society of Anesthesiology and the Chinese Association of Anesthesiologists present recommendations from their experience in managing patients with COVID-19 during the perioperative period. Cover Illustration: A. Johnson, Vivo Visuals.

- Kharasch and Jiang: Novel Coronavirus 2019 and Anesthesiology, p. 1289
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-  **Intubation and Ventilation amid the COVID-19 Outbreak: Wuhan's Experience**
L. Meng, H. Qiu, L. Wan, Y. Ai, Z. Xue, Q. Guo, R. Deshpande, L. Zhang, J. Meng, C. Tong, H. Liu, L. Xiong.....1317



The authors summarize the experience of managing intubation and ventilation for critically ill patients with COVID-19 in Wuhan. Anesthesiologists and intensivists are mandated to provide the best practices while following strict self-protection precautions.

- Response of Chinese Anesthesiologists to the COVID-19 Outbreak**
H.-F. Zhang, L. Bo, Y. Lin, F.-X. Li, S. Sun, H.-B. Lin, S.-Y. Xu, J. Bian, S. Yao, X. Chen, L. Meng, X. Deng.....1333

During the COVID-19 outbreak, international and Chinese anesthesiologists have been making efforts and taking speedy actions, which are gathering lessons and inspirations in response to devastating contagious diseases nationwide.

- Establishing and Managing a Temporary Coronavirus Disease 2019 Specialty Hospital in Wuhan, China**
W. Zhu, Y. Wang, K. Xiao, H. Zhang, Y. Tian, S. P. Clifford, J. Xu, J. Huang1339




Temporary COVID-19 specialty hospitals proved to be useful in the control of an infectious crisis in a large epicenter, and hopefully this approach provides a blueprint for the management of future epidemics or pandemics.

-   **COVID-19 Infection: Implications for Perioperative and Critical Care Physicians**
J. R. Greenland, M. D. Michelow, L. Wang, M. J. London.....1346




Patients with COVID-19 may require intubation and critical care management. This comprehensive review summarizes management recommendations in critical care and perioperative settings, based on current understanding of coronavirus biology and acute respiratory distress syndrome pathophysiology.

Perioperative Medicine

CLINICAL SCIENCE

-   **Defining the Minimal Clinically Important Difference and Patient-acceptable Symptom State Score for Disability Assessment in Surgical Patients**
 *M. A. Shulman, J. Kasza, P. S. Myles*.....1362




Using previously collected data from three studies across 4,361 patients, a 5% change in score after surgery is clinically important. Patients with a scaled disability score less than 16% after surgery have an acceptable symptom state and can be considered as disability-free.

-    **Sugammadex versus Neostigmine for Reversal of Neuromuscular Blockade and Postoperative Pulmonary Complications (STRONGER): A Multicenter Matched Cohort Analysis**
S. Kheterpal, M. T. Vaughn, T. Z. Dubovoy, N. J. Shah, L. D. Bash, D. A. Colquhoun, A. M. Shanks, M. R. Mathis, R. G. Soto, A. Bardia, K. Bartels, P. J. McCormick, R. B. Schonberger, L. Saager1371

In a multicenter observational matched cohort study of noncardiac surgery, sugammadex administration was associated with a 30% reduced risk of pulmonary complications, a 47% reduced risk of pneumonia, and a 55% reduced risk of respiratory failure compared to neostigmine.

- Intrathecal Morphine versus Intrathecal Hydromorphone for Analgesia after Cesarean Delivery: A Randomized Clinical Trial**
E. E. Sharpe, R. J. Molitor, K. W. Arendt, V. E. Torbenson, D. A. Olsen, R. L. Johnson, D. R. Schroeder, A. K. Jacob, A. D. Niesen, H. P. Sviggum1382

In a randomized, double-blinded trial, intrathecal hydromorphone and intrathecal morphine were compared in women receiving cesarean delivery using pain score at 24 h as the primary outcome. The analgesia provided by morphine was not superior to that provided by hydromorphone. In addition, breakthrough analgesic requirements were similar for the two groups.

-   **Altered Global Brain Signal during Physiologic, Pharmacologic, and Pathologic States of Unconsciousness in Humans and Rats**
 *S. Tanabe, Z. Huang, J. Zhang, Y. Chen, S. Fogel, J. Doyon, J. Wu, J. Xu, J. Zhang, P. Qin, X. Wu, Y. Mao, G. A. Mashour, A. G. Hudetz, G. Northoff*.....1392

Functional magnetic resonance imaging of global brain signal amplitude and functional connectivity demonstrates a strong association between overall brain connectivity and the level of consciousness in both humans and rats. Each distinct state of unconsciousness, including sleep, general anesthesia, and unresponsive wakefulness syndrome, showed state-specific alterations in global signal topography. These findings suggest that the global temporal coordination defines the coarse-grained state of consciousness versus unconsciousness, while the relationship of the global and local signals defines the particular qualities of that unconscious state.

🌐 **Association of Surgical Hospitalization with Brain Amyloid Deposition: The Atherosclerosis Risk in Communities–Positron Emission Tomography (ARIC–PET) Study**

K. A. Walker, R. F. Gottesman, J. Coresh, A. R. Sharrett, D. S. Knopman, T. H. Mosley, A. Alonso, Y. Zhou, D. F. Wong, C. H. Brown IV1407

This study found no differences in brain amyloid levels measured by positron emission tomography scans more than a decade after hospitalization for a surgical procedure when compared with patients who were not hospitalized and did not have a surgical procedure. When low-risk surgical procedures were removed from the analysis, there was a small but statistically significant increase in brain amyloid in patients who had high-risk surgical procedures when compared with all patients who did not have a surgical procedure. On secondary analysis, patients with two or more surgical hospitalizations had a higher odds of elevated brain amyloid during late life when compared with participants with no surgical hospitalizations regardless of whether they had been hospitalized for medical reasons. These data suggest that high-risk surgical procedures and multiple surgical procedures may be associated with increases in brain amyloid.

Olanzapine for the Prevention of Postdischarge Nausea and Vomiting after Ambulatory Surgery: A Randomized Controlled Trial

J. B. Hyman, C. Park, H.-M. Lin, B. Cole, L. Rosen, S. S. Fenske, R. L. Barr Grzesch, S. V. Blank, S. B. Polsky, M. Hartnett, P. J. Taub, V. Palvia, S. DeMaria Jr., C. Ascher-Walsh1419

The authors randomized women having day surgery to olanzapine 10 mg or placebo. All were also given both dexamethasone and ondansetron. Olanzapine reduced nausea and vomiting in the 24 h after hospital discharge from 38% to 14%, corresponding to a number-needed-to-treat of just four patients.

🌐 **Volatile Anesthetics versus Propofol for Cardiac Surgery with Cardiopulmonary Bypass: Meta-analysis of Randomized Trials**

A. Bonanni, A. Signori, C. Alicino, I. Mannucci, M. A. Grasso, L. Martinelli, G. Deferrari1429

This systematic review and meta-analysis included data from randomized clinical trials published through the year 2019 and assessed 8,197 patients undergoing cardiac surgery with cardiopulmonary bypass. Although early postoperative mortality did not differ significantly between the anesthetic groups, 1-yr mortality was significantly lower in the patients who received volatile anesthetics. Additionally, patients in the volatile anesthetic group had significantly lower occurrence of perioperative myocardial infarction and troponin release and had higher postoperative cardiac index.

🌐 **Defining an Intraoperative Hypotension Threshold in Association with De Novo Renal Replacement Therapy after Cardiac Surgery**

J. M. C. Ngu, H. Jabagi, A. M. Chung, M. Boodhwani, M. Ruel, M. Bourke, L. Y. Sun1447

Varying definitions of hypotension before and during cardiopulmonary bypass are not associated with renal replacement therapy. Mean arterial pressure less than 55 or between 55 and 64 mmHg for 10 or more minutes after cardiopulmonary bypass is associated with renal replacement therapy. The association of post-cardiopulmonary bypass hypotension with renal replacement therapy is weaker than nonmodifiable procedure and patient risk factors.

🌐 **Preoperative Cognitive Abnormality, Intraoperative Electroencephalogram Suppression, and Postoperative Delirium: A Mediation Analysis**

B. A. Fritz, C. R. King, A. Ben Abdallah, N. Lin, A. M. Mickle, T. P. Budelier, J. Oberhaus, D. Park, H. R. Maybrier, T. S. Wildes, M. S. Avidan, for the ENGAGES Research Group1458

The indirect effect of intraoperative electroencephalogram suppression on the development of postoperative delirium among patients with preexisting cognitive impairment is probably small but nonzero. Approximately 28 cognitively impaired patients would need to be kept out of electroencephalogram suppression to avoid 1 case of postoperative delirium.

BASIC SCIENCE

🌐 **Sevoflurane Enhances Proliferation, Metastatic Potential of Cervical Cancer Cells via the Histone Deacetylase 6 Modulation *In Vitro***

W. Zhang, B. Sheng, S. Chen, H. Zhao, L. Wu, Y. Sun, J. Cui, X. Zhu, D. Ma1469

Sevoflurane enhances the malignant potential of two immortalized cervical cancer cell lines *in vitro*. The underlying mechanisms include sevoflurane-induced increase in histone deacetylase 6, which, *via* changes in cellular cytoskeleton dynamics, may promote the invasive properties of cervical cancer cells.

Critical Care Medicine

CLINICAL SCIENCE

🌐 **Neurally Adjusted Ventilatory Assist versus Pressure Support Ventilation in Difficult Weaning: A Randomized Trial**

L. Liu, X. Xu, Q. Sun, Y. Yu, F. Xia, J. Xie, Y. Yang, L. Heunks, H. Qiu1482

In selected patients difficult to wean from mechanical ventilation, neurally adjusted ventilatory assist improves patient outcome indicated by reduction in duration of weaning. Such a benefit seems most prominent in tracheostomized patients.

Diagnostic Accuracy of Diaphragm Ultrasound in Detecting and Characterizing Patient–Ventilator Asynchronies during Noninvasive Ventilation

E. Vivier, A. F. Haudebourg, P. Le Corvoisier, A. M. Dessap, G. Carteaux.....1494

In 15 healthy volunteers, ultrasound assessment of diaphragm excursion and thickening detected noninvasive ventilator asynchronies with high sensitivity and specificity when compared with assessment of respiratory flow/pressure tracings. Surface diaphragm electromyography also had significantly higher sensitivity and specificity for detecting noninvasive ventilator asynchronies, but was only able to be successfully implemented in 60% of the study patients, suggesting that ultrasound assessment of diaphragm excursion and thickening is a more feasible technique for detecting ventilator asynchrony.

BASIC SCIENCE

Inhibition of Sphingosine Kinase 1 Attenuates Sepsis-induced Microvascular Leakage via Inhibiting Macrophage NLRP3 Inflammasome Activation in Mice

M. Zhong, W. Wu, Y. Wang, H. Mao, J. Song, S. Chen, D. Zhu.....1503

In peripheral blood mononuclear cells from septic patients, lipopolysaccharide-stimulated sphingosine-1-phosphate messenger RNA expression was higher than in cells from healthy volunteers. In male mouse model of sepsis, treatment with a specific inhibitor of sphingosine kinase 1 decreased mortality, improved peripheral perfusion, and diminished capillary leak. Results suggest that sphingosine kinase 1 may participate in NLRP3 activation, and septic lung injury and mortality in mice.

Nebulization of Vancomycin Provides Higher Lung Tissue Concentrations than Intravenous Administration in Ventilated Female Piglets with Healthy Lungs

C. L. d. M. Morais, J. W. L. Nascimento, A. C. Ribeiro, L. I. Cortinez, M. J. C. Carmona, D. R. R. Maia, A. Monsel, J. O. C. Auler Jr., J.-J. Rouby, D. A. Otsuki.....1516

The hypothesis that lung tissue vancomycin concentrations will be higher after administration as an inhaled aerosol than after intravenous administration was tested in healthy, anesthetized, mechanically ventilated female piglets. One hour after administration of a 37.5 mg/kg aerosol dose, the median lung tissue vancomycin concentration (161 µg/g) was 13 times that after intravenous administration of 15 mg/kg (12 µg/g). Twelve hours after aerosol administration, the median lung tissue vancomycin concentration was 63 µg/g, while 12 h after intravenous administration, vancomycin was undetectable in 60% of lung specimens.

Pain Medicine

CLINICAL SCIENCE

Persistent Postoperative Opioid Use: A Systematic Literature Search of Definitions and Population-based Cohort Study

N. K. Jivraj, F. Raghavji, J. Bethell, D. N. Wijesundera, K. S. Ladha, B. T. Bateman, M. D. Neuman, H. Wunsch1528

A systematic search of the literature revealed 29 distinct definitions of persistent opioid use employed in 39 different studies. Applying the definitions to a separate study cohort of more than 162,000 surgical patients identified persistent opioid use rates varying more than 100-fold with low sensitivity for the identification of opioid use disorder.

BASIC SCIENCE

Local Sympathectomy Promotes Anti-inflammatory Responses and Relief of Paclitaxel-induced Mechanical and Cold Allodynia in Mice

R. Tonello, W. Xie, S. H. Lee, M. Wang, X. Liu, J. A. Strong, J.-M. Zhang, T. Berta.....1540

Local surgical sympathectomy relieved nociceptive and mechanical sensitization in a mouse model of paclitaxel-induced pain. Transforming growth factor-β was enhanced in mice after sympathectomy and was capable of reducing paclitaxel-induced mechanical sensitization.

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Airway Anatomy of an Adult with Hurler's Syndrome

N. M. Dalesio, O. A. Ifaturoti, C. M. Tomeldan, T. P. Tran.....1557

ORIGINAL INVESTIGATION IN EDUCATION

Opioid Stewardship Program and Postoperative Adverse Events: A Difference-in-differences Cohort Study

A. M. Barrevel, R. J. McCarthy, N. Elkassabany, E. R. Mariano, B. Sites, R. Ghosh, A. Buvanendran1558

The investigators conducted a difference-in-difference analysis before and after implementation of opioid training in 31 intervention hospitals and 33 nonintervention hospitals. The 6-month-long opioid education consisted of webinars on pain assessment, multimodal analgesia, and safer opioid use. The educational initiative did not substantively change opioid use.

CLINICAL FOCUS REVIEW

Driving Pressure for Ventilation of Patients with Acute Respiratory Distress Syndrome

A. Meier, R. E. Sell, A. Malhotra1569

Measuring driving pressure (defined by plateau pressure minus positive end-expiratory pressure) is a useful addition to existing variables when setting mechanical ventilation, particularly in the acute respiratory distress syndrome.

◇ Neuromuscular Blockade Applicability in Early Acute Respiratory Distress Syndrome

W. E. Hurford1577

Neuromuscular blockade with deep sedation appears to offer no advantage to patients with acute respiratory distress syndrome who can be managed with lighter sedation. In those patients requiring deep sedation, the addition of neuromuscular blockade may be beneficial.

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