



Hi, this is Evan Kharasch, Editor-in-Chief of ANESTHESIOLOGY, with some highlights from the June 2021 issue, as selected by the journal editors.

In this month's podcast, we'll be exploring new evidence related to gastric emptying time in neonates, trends in inpatient pediatric surgery concentration, and the safety of neuromuscular blockade reversal agents. Other highlighted studies examine the risk factors for postpartum hemorrhage and ideal mechanical ventilation approaches for obese patients. We'll also discuss some basic science insights and new clinical reviews that will aid your practice.

Let's begin this month with an observational clinical study evaluating gastric emptying time in formula-fed neonates. The study, which used serial ultrasound to assess 46 healthy full-term neonates, found that gastric emptying was less than 2 hours with formula feeding. That is significantly faster than the current pre-procedural fasting guideline of 6 hours from the American Society of Anesthesiologists, and much longer than the 2.5 to 3 h intervals at which infants are typically fed. Dr. Jennifer Lee of Columbia University conducted the study with colleagues from the University of Pittsburgh, the University of California, San Francisco, and the New York Eye and Ear Infirmary of Mount Sinai. The investigators performed ultrasound before and after feeding at 15-minute intervals until a return to baseline. Ultrasound images of the gastric antrum were used to estimate gastric volumes. On average, gastric emptying times were 93 minutes, ranging from a low of 45 minutes to a high of 150 minutes. The investigators point out that the current ASA guidelines fail to account for the potential for dehydration and hypoglycemia. The investigators concluded that the current fasting guidelines for formula-fed neonates requiring anesthesia and sedation are more stringent than necessary, by more than 3 hours. Read the full study for free in this month's issue. Also, refer to the editorial by Dr. Laszlo Vutsits, which makes the case that the benefits of reducing fasting times are likely to outweigh any potential risk for healthy neonates.

Our next study explores of the trend of increasing consolidation of inpatient pediatric surgery services in the United States at a small number of select hospitals. Dr. Michael McManus and Dr. Urbano Franca, both of Boston Children's Hospital, conducted this two-part assessment. They found that pediatric surgical care was already highly concentrated into certain centers even before the implementation of the American College of Surgeons' Children's Surgery Verification Program. The study looked at the period immediately before the launch of that program. In part one, the investigators evaluated all-encounter data from 6 states. In part two, they evaluated the generalizability of the state data against the 2016 Healthcare Cost and Utilization Project Kids' Inpatient Database. The findings from the two datasets were strikingly similar. In the state data evaluation, they found that children's hospitals, specialty hospitals, and large general hospitals with capabilities similar to children's hospitals accounted for less than 7% of all hospitals. However, they performed 83% of all pediatric procedures. When looking at the national dataset, they found that less than 9% of hospitals that admit children accounted for 90% of all pediatric procedures. The authors concluded that pediatric surgical care was already highly concentrated before the roll out of the Children's Surgery Verification Program. They note that the consolidation of pediatric surgical care has a number of important implications, ranging from workforce distribution to general access to care. The article is available for free in this month's issue. Read the accompanying editorial for more information about what these trends mean for pediatric training in anesthesia residencies, educational preparation of pediatric anesthesia subspecialists, and the implications for pediatric anesthesia fellowships.

Next, we have a retrospective registry analysis evaluating the rate of postoperative pulmonary complications associated with the use of different drugs for reversal of neuromuscular blockade. The study was conducted by Gen Li and colleagues at Vanderbilt University in Nashville. The investigators evaluated the data from 7,800 surgical patients who had received neostigmine and nearly 2,700 patients receiving the newer agent, sugammadex. This reflected a wholesale switch from neostigmine to sugammadex, at a single academic tertiary care center. They looked specifically at a composite of pulmonary complications that included pneumonia, prolonged mechanical ventilation, and unplanned intubation, within 30 days of surgery.

Overall, the rate of postoperative complications in all patients was 5.5%, with a slightly higher rate for neostigmine, 5.9%, and a slightly lower rate for sugammadex, 4.2%. After adjustments, there was no statistically significant difference in the occurrence of postoperative pulmonary complications between the two neuromuscular blockade reverse agents. The authors concluded that switching neuromuscular blockade reversal agents was not associated with a difference in the occurrence of postoperative pulmonary complications. This article is available for free in this month's issue. Be sure to also check out the related editorial, which highlights the conflicting data regarding the association between neuromuscular antagonist use and pulmonary outcomes. And which explores the landscape of current evidence and the costs associated with neuromuscular blocking drug reversal agents and postoperative pulmonary complications.

Our next study sheds light on a possible new risk factor for postpartum hemorrhage. Researchers led by Dr. Alexander Butwick of Stanford University School of Medicine and colleagues in the U.S. and Sweden, found a significant association between post-term birth and the risk for postpartum hemorrhage. The researchers examined live delivery data for more than 2 million deliveries in California and about 300,000 in Sweden. They saw significant differences in the rate of postpartum hemorrhage in the two cohorts, with a rate of 3.2% in California and 7.1% in Sweden. They also found an increased risk for hemorrhage in both cohorts for deliveries between 41 and 42 weeks, when compared to term deliveries. There was also an elevated risk seen between 22 and 27 weeks, but only for deliveries in the California cohort. The study authors advised clinicians to be aware of this evidence when assessing risk for hemorrhage and suggested it should inform clinical guidelines. The article is available for free in this month's issue. A related editorial notes that enhanced assessment of postpartum hemorrhage risk is a national priority for maternal safety. It also explores what is known about postpartum hemorrhage risk and suggests the time may be right to consider post-term gestational age as a risk factor, especially if other large studies show a strong association.

Next, we have a secondary analysis showing superiority for individualized positive end-expiratory pressure – or PEEP – over fixed PEEP for intraoperative mechanical ventilation of obese patients. The study was conducted by Dr. Philipp Simon and the PROBESE investigators of the Protective Ventilation Network and the Clinical Trial Network of the European Society of Anesthesiology. The study pools data on obese patients from two previously published studies: the multicenter PROBESE trial and a local single-center trial at the University of Leipzig Medical Center in Germany. All patients evaluated had undergone elective laparoscopic abdominal surgery and had a body mass index of at least 35. They were randomized to either low PEEP – 4 to 5 cm H₂O, or to a recruitment maneuver followed by either PEEP of 12 cm H₂O or individual PEEP which was determined by electrical impedance tomography. The analysis found that median individualized PEEP levels were 18 cm H₂O, and resulted in better intraoperative oxygenation, lower driving pressures, and redistribution of ventilation, compared with fixed PEEP at both high and low levels. But the study also found that the benefits of individualized PEEP disappeared after extubation. Individualized PEEP also resulted in improvements in lung function, but the analysis was not powered to show improvements in clinical outcomes. The authors conclude that while the intraoperative outcomes were better with individualized PEEP, the impact on patient outcome is unclear. The article is available for free in this month's issue. A related editorial takes us down the long road of understanding PEEP selection and explores some of the key unanswered questions. It suggests that very high PEEP levels, greater than 10-12 cm H₂O should not be routinely implemented in clinical practice before we obtain more definitive evidence that this ventilation approach is associated with improved pulmonary outcomes.

Our next article reports basic science research looking at mitochondrial function and anesthetic sensitivity in the spinal cord of mice with a mutation in the protein Ndufs4 that makes them hypersensitive to anesthesia. The experiment revealed a link between anesthetic sensitivity, mitochondrial function, and post-synaptic channel activity that could have downstream clinical implications related to the minimum alveolar concentration, or MAC. The study was conducted by Christian Woods of the Seattle Children's Research Institute and colleagues at the University of

Washington. The researchers tested the hypothesis that volatile anesthetics would disrupt the pre-synaptic function or other neuronal characteristics in the spinal cord neurons of mice with a mutation that knocked out the protein *Ndufs4*. While their initial hypothesis was incorrect, what they found instead was interesting. Pre-synaptic functions in the mutated mouse spinal cords were not hypersensitive to isoflurane. Instead, the hypersensitivity in the mutated mice was mediated by interneurons in the ventral horn. The manuscript concludes that the data link anesthetic sensitivity, mitochondrial function and post-synaptic channel activity. Also, check out the related editorial, which explores the issue of MAC and the new questions raised by this basic research. It reminds us that anesthetics are dirty drugs – having multiple effects in numerous organs. And that different mechanisms underlie ‘anesthesia’ in these different systems, like the brain, spine and autonomic nervous system. And lastly, because of this there can be no universal ‘depth-of-anesthesia’ measure.

Next is our Clinical Focus Review article that examines perioperative management of patients for whom transfusion is not an option. Dr. Nicole Guinn of Duke University Medical Center and colleagues at Johns Hopkins Medical Institutions authored this report. The authors emphasized the need for careful planning, documentation, and the involvement of a multidisciplinary care team to achieve blood conservation at the preoperative, intraoperative, and postoperative phases. These techniques range from early diagnosis and treatment of anemia, to use of topical sealants and hemostatic agents, to minimizing laboratory testing.

Since Jehovah’s Witness patients make up a significant portion of patients who cannot be transfused, it is critical to determine what other therapies are acceptable. Some of these patients may accept minor fractions, such as cryoprecipitate, albumin, immunoglobulins, and individual clotting factors. For more details and suggested protocols, see the full article in the journal.

I’ll close this month with a Review Article that describes the various scoring systems for quantitative lung ultrasound and how they can be used in different settings. The review was written by Dr. Silvia Mongodi of San Matteo Hospital in Pavia, Italy, and colleagues from centers across Europe. The article breaks down use of scoring systems for the acutely ill patient, the critically ill patient, and patients in the perioperative setting, as well as pediatric and neonatal patients, and its use as a tool in chronic disease management. The review even tackles how lung ultrasound can be used to accurately predict severity of disease in COVID-19 patients. Check out the full article for details and information on how computer-aided technology could make assessments even faster.

Thank you for your interest in and support of the *ANESTHESIOLOGY* journal and podcast. I hope the information provided helps to guide and improve your clinical practice. I look forward to sharing more important research with you next month.