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

In this month's podcast, we'll be exploring new information about a potentially game-changing neuromuscular monitoring device. We'll also take a look at the use of head-mounted technology for guiding ultrasound. We'll discuss some details of whether splanchnic neurolytic blocks have a place in managing pain in patients with unresectable pancreatic cancer. And we'll close this month by highlighting two clinical focus reviews, one on the opportunities for recycling and repurposing of plastics used in anesthesia, and a second on the challenges of anticoagulant monitoring in the perioperative setting.

1) 20-02021

Let's begin this month with a clinical investigation of neuromuscular monitoring devices. We know that quantitative monitoring of neuromuscular function decreases the incidence of residual neuromuscular blockade. However, the lack of easy to use and reliable neuromuscular monitors remains a problem in routine anesthesia practice. Electromyography has been proposed as a simpler, more effective alternative to acceleromyography, which has several caveats and precautions in order to obtain exact train-of-four ratio measurements. In a prospective study led by Dr. Reka Nemes of the University of Debrecen, Hungary, 48 adults who underwent surgery requiring muscular relaxation were monitored using both devices simultaneously. The primary endpoint was the agreement between acceleromyography and electromyography train-of-four ratios greater than or equal to 80%, as an indicator of recovery. The bias toward acceleromyography was 1.3 with a train-of-four ratio greater than or equal to 80%, compared to a bias of -0.5 toward electromyography with a train-of-four ratio greater than or equal to 80. The authors noted that electromagnetic emissions in the operating room could potentially disrupt electromyography, but this was managed with a noise filter. According to the authors, the results suggested that, compared to acceleromyography, the electromyography device was a stronger indicator of recovery from neuromuscular block, and, readiness for safe tracheal extubation. An editorial by Drs. Andrew Bowdle and Kelly Michaelsen accompanies this article. They noted that although electromyography addresses the limitations of acceleromyography, it comes with some limitations of its own. These include the noise, which can be hard to differentiate from the ambient electrical noise of an operating room. Drs. Bowdle and Michaelson emphasized that electromyography is the future of quantitative twitch monitoring because it addresses the limits of acceleromyography. But, they identify the need for further validation of current commercially-available electromyography-based monitors, and the need for studies comparing them to mechanomyography. Check out the full article for free in this month's issue.

2) 21-00514

We next take a look at another clinical study, which explored the use of smart glasses for radial arterial catheterization in pediatric patients. We see that ultrasound-guided procedures are becoming more common in children. However, challenges remain due to the need for improved ergonomics and hand-eye coordination, in order to navigate the small vessel size in children. Head-mounted displays, specifically smart glasses, are becoming more widely used in medical practice. These glasses, when connected to the ultrasound machine, allow the user to see both the procedure field and ultrasound screen simultaneously, which ideally will reduce procedure time and clinician fatigue. However, the use of smart glasses for arterial catheterization in pediatric patients has not been examined. In a prospective study led by Dr. Young-Eun Jang of Seoul National University Hospital, Korea, researchers randomized 116 children younger than 2 years to a smart glasses group or standard ultrasound control group. The primary outcome was the first attempt success rate. The smart glasses group had a significantly higher first-attempt success rate of 88% compared to 72% for the control group. The smart glasses users also reported greater ergonomic satisfaction than the controls, and patients in the smart glasses group experienced significantly fewer complications. According to the authors, these findings supported the use of smart glasses for radial artery cannulation in children. In an accompanying editorial, by Drs. Marcellene Franzen, Ganesh Krishnamurthy, and Jorge Galvez, these three emphasized the ability of head-mounted displays to address some challenges of ultrasound device use in the operating room setting. They complimented the authors on their "elegant" study, but also noted areas for further research. These included the use of wireless technology for head-mounted technology, and more practical considerations such as proper fit and hygiene if devices are to be shared. This article is available for free in this month's issue.

3) 20-02039

Our next clinical study reviewed the impact of a neurolytic splanchnic nerve block on pain relief, survival, and quality of life in pancreatic cancer patients with unresectable disease. We know that the prognosis and quality of life for these patients is poor, and palliative care with pain relief has become an important part of treatment. The use of a splanchnic nerve block is one alternative treatment to reduce opioid use, but data on its effectiveness have been mixed. Researchers led by Dr. Daosong Dong of China Medical University conducted a randomized, double-blind trial in five locations in China in which 96 pancreatic cancer patients with moderate-to-severe pain received injections of either splanchnic nerve block with absolute alcohol or normal saline control. The follow-up was 8 months or until death. The authors found that pain relief was significantly greater in the nerve block group compared with the control group based on Visual Analog Scale scores. Opioid use was significantly lower in the nerve block group during the first five months compared with placebo. An additional interesting finding was that survival was significantly greater in the nerve block group, except in patients with stage IV disease. No differences in quality of life were reported between the groups. In an accompanying editorial, a quartet of clinicians weighed in with comments. Drs. James Rathmell, Elizabeth Rickerson, James Tulsky, and Keith Lillimoe emphasized that the use of sympathetic neurolysis, including splanchnic neurolytic blocks, remains a topic of debate. Although patients experienced pain relief and used fewer opioids, the authors noted that both of these effects were short-lived, and they expressed concern about how to interpret the reduced survival in patients with stage IV disease, and the possible lack of generalizability of the study findings to patients in other countries. The authors suggested limiting sympathetic neurolysis to patients with stage III disease and below in the absence of additional evidence. You can access this article for free in this month's issue.

3) 20-01434

Next, we have a retrospective cohort study that examined the associations between the use of various crystalloids and delayed graft function in patients undergoing kidney transplants. To date, no randomized trials of balanced crystalloids versus normal saline have shown clear superiority of one fluid over the other in terms of kidney graft function. Crystalloid solutions are considered first-line therapy for fluid management during kidney transplant procedures, and balanced crystalloids have demonstrated fewer adverse effects compared with normal saline. However, the effect of normal saline versus crystalloids on kidney graft function remains unclear. And there are concerns about the risk of hyperkalemia from the potassium in balanced crystalloids. Dr. Kerstin Kolodzie of the University of California, San Francisco, and colleagues reviewed 2,515 anesthesia records from a national transplant registry between 2005 and 2015. The authors categorized the use of normal saline as low (30% or less of total fluids), intermediate (from 30% to 80%) and high (80% or more of fluid). Overall, for deceased donor transplants, the incidence of delayed graft function in the low, intermediate, and high normal saline groups was 24%, 29%, and 31%, respectively. For living donor transplants, the incidence of delayed graft function in the low, intermediate, and high normal saline groups was 5%, 5%, and 6%. According to the authors, the results suggested that higher percentages of normal saline were significantly associated with greater delayed graft function. In a related editorial, Drs. Duminda Wijeysundera and Stuart McCluskey observed that "less is more" in terms of normal saline, as a way to optimize short- and long-term function of transplanted kidneys. They encouraged anesthesiologists to consider whether there are advantages to normal saline, given the findings of the current study and previous research showing that normal saline does not prevent hyperkalemia. This article is available for free in this month's issue.

5) 21-00036

Next, we turn to a review of the association between anesthesia method and tourniquet use on postsurgical pain following total knee arthroplasty. Postsurgical pain after this procedure is a major independent risk factor for revision surgery, and also a major reason for patient dissatisfaction. Previous research has shown that anesthesia method and tourniquet use may affect postsurgical complications, but their impact on persistent postsurgical pain has not been well studied. Dr. Riku Palanne and colleagues at the University of Helsinki, Finland, conducted a secondary analysis of a randomized trial of patients aged 18 to 75 years who underwent knee

arthroplasty. Patients were randomized to four groups: spinal anesthesia with or without tourniquet, or, general anesthesia with or without tourniquet. The main outcome was a change in average pain 12 months after surgery. Overall, the change in pain scores was not significantly different based on spinal versus general anesthesia. Pain scores decreased less in no-tourniquet groups, but did not reach minimum clinical importance. The authors conceded that the study was limited by the open-label design and the inability to separate residual preoperative pain from possible chronic pain due to surgery. However, they concluded that type of anesthesia and use of tourniquet had no clinically meaningful impact on pain after knee arthroplasty. The article is available for free in this month's issue.

6) 20-02102

Lets turn now to the laboratory. Our next study investigated how a four-factor prothrombin complex concentrate might manage trauma-related hemorrhage, especially in the setting of anticoagulation therapy. Clinically, an optimal management strategy for reducing bleeding and reversing anticoagulation has yet to be determined, but several guidelines currently recommend the use of prothrombin complex concentrates. A team of researchers led by Farahnaz Ryatdoost of Aachen University Hospital, Germany, used a pig model to test the hypothesis that four-factor prothrombin complex concentrate could treat trauma-related hemorrhage in the presence of anticoagulation. The researchers induced trauma in 48 anesthetized male pigs who had rivaroxaban-induced anticoagulation. Some were treated with prothrombin complex alone at doses of 25 U/kg, 50 U/kg, and 12.5 U/kg, and some also received tranexamic acid and fibrinogen concentrate; 8 pigs were untreated controls. Overall, the prothrombin complex concentrate at doses of 25 U/kg, 50 U/kg, and 12.5 U/kg reduced blood loss, and restored hemostasis, and improved thrombin generation in the pig models compared with control pigs. The researchers also explored the combination of 12.5 U/ kg prothrombin complex concentrate plus tranexamic acid with and without fibrinogen concentrate. In this part of the study, blood loss was significantly lower when both tranexamic acid and fibrinogen concentrate were added to prothrombin complex concentrate compared to the addition of tranexamic acid alone. The authors concluded that the findings support the value of prothrombin complex concentrate to manage post-traumatic bleeding in the presence of rivaroxaban anticoagulation. They also suggested that it might be even more effective as part of a multimodal approach. The potential of prothrombin complex concentrate was supported in an accompanying editorial by Drs. Donat Spahn, Alexander Kaserer, and Jan-Dirk Studt of the University of Zurich, Switzerland. However, these three authors emphasized the challenge in extrapolating information to humans, especially when the anticoagulant is unknown, and also noted the relatively short observation time for safety assessment.

7) 20-02138

We have two clinical focus reviews this month. The first focuses on the environment. It examined the use and disposal of plastic in the operating room. Maggie Xiao, a medical student at the University of Alberta, Canada, and colleagues under the supervision of senior author Dr. William Chan, reviewed research and presented a roadmap of ways to reduce, reuse, and recycle in the clinical setting. The researchers highlighted several examples of plastic products used for anesthesia in the perioperative setting that can potentially be recycled, at least in some areas. Some of these include saline and water ampoules; irrigation solution bottles; packaging for syringes, oxygen masks, and IV sets; wraps for warming blankets; paper-looking sterile wrapping for instruments; and spinal, epidural, and central line trays. The researchers also discussed opportunities for reprocessing medical devices to reduce the volume of biomedical waste. Some examples include cleaning and packaging of single-use items such as laryngoscopes and ventilator circuits. The authors noted that the U.S. Food and Drug Administration and Health Canada have approved select third-party reprocessors based on strict adherence to safety and quality standards.

8) 21-00486

Our last article this month is a clinical focus review of anticoagulation monitoring in the perioperative setting. The review was written by Dr. Cheryl Maier and Dr. Roman Sniecinski, both of Emory University. Many patients, especially older adults, are on some type of anticoagulant therapy. As a result, clinicians may face the challenge of monitoring the effects of these medications during the perioperative period. Drs. Maier and Sniecinski presented a coagulation cascade divided into three pathways—extrinsic, intrinsic, and common—to help guide clinicians in determining the presence of an anticoagulant. This decision tree for testing offers algorithms based on whether the clinician is urgently ruling out a clinical effect or monitoring an anticoagulant dose. The algorithm presents testing options based on suspected oral agent or the use of a parenteral agent, with guidance for the use of tests including prothrombin time and international normalized ratio, Anti-Xa assay, thrombin time, activated clotting time, dilute thrombin time, and partial thromboplastin time. The authors noted other challenges, including monitoring patients during anticoagulation transitions, and the need to consider residual testing effects of oral anticoagulants in cases of procedural anticoagulation if activated clotting time monitoring is planned. They concluded that more information is needed on the clinical utility of anticoagulation testing to better monitor their effects in a timely way in the clinical setting.

If you will be attending Anesthesiology 2021 in San Diego this month, don't miss the journal-sponsored sessions including the Symposium on COVID-19: New Paradigms and Challenges for Anesthesiologists, the Breaking Clinical Trials Session, Best of Abstract sessions, and the Celebration of Research featuring hotdogs. Find out more on the journal website, www.pubs.asahq.org/anesthesiology.

As always, thank you for listening to this podcast and thank you for your support of Anesthesiology. I hope you find the information presented helps to guide and improve your clinical practice. I look forward to sharing more important research with you next month.