ASRA NEWS

A PUBLICATION OF THE AMERICAN SOCIETY OF REGIONAL ANESTHESIA AND PAIN MEDICINE

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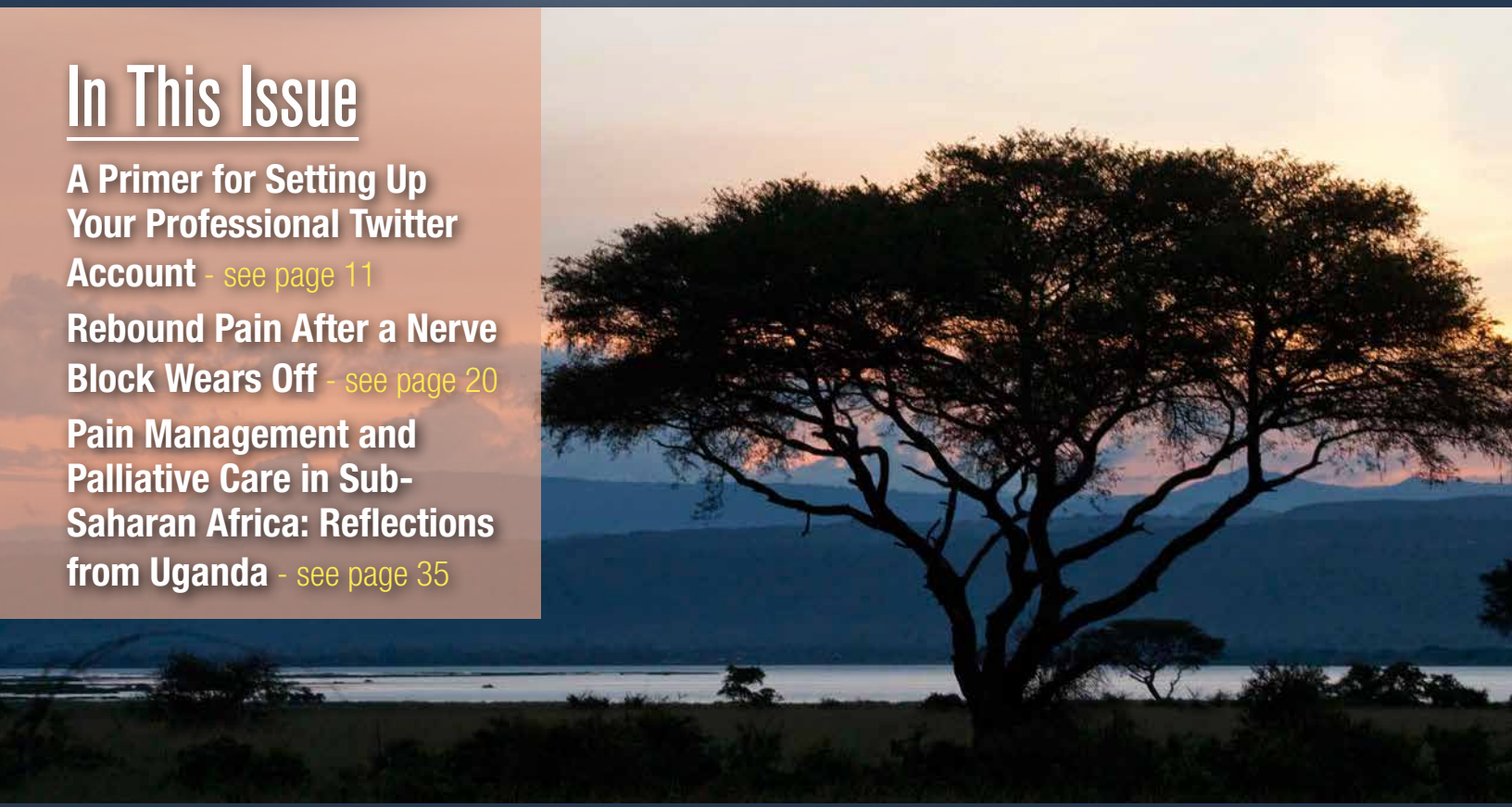
In This Issue



Advancing the science and practice of regional anesthesiology and pain medicine to improve patient outcomes through research, education, and advocacy

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American Society of Regional Anesthesia and Pain Medicine

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Social Media: A Powerful Tool When Used Appropriately?

Social media has completely changed our culture and way of life in a relatively short time frame. It's hard to imagine that at one time, phones only made phone calls, cameras were needed to take pictures, and awkward blind dates were your first chance to check out potential mates.

Even in just the past 3 years, many of my colleagues have moved away from thinking Twitter was for chatting about breakfast to realizing that Twitter is an important part of providing high-quality patient care. As ASRA Board Member Ed Mariano, MD, wrote in his 2016 piece, "Why All Doctors Should Be on Twitter," "Twitter provides an invaluable resource for conversations across the globe, finding and disseminating research, and enriching the conference experience." Dr Mariano provided several examples of the power of social media, including the fact that "highly tweeted articles are 11 times more likely to be cited by future publications than articles that are not tweeted." That means 11 times more awareness of data that may be critical for the improvement of practice.[1]

ASRA uses social media to facilitate information sharing, and the best example is probably during our annual meetings and workshops, where the conversation can happen during the talks and even involve those who aren't present. The conversation continues long after the meeting as well, and ASRA publishes a transcript of the Twitter hashtag feed on its meeting page. Each ASRA annual meeting has surpassed the previous one in the number of Twitter impressions. ASRA's members have even studied the effect of this social media activity, culminating in journal articles on the subject.[2,3] Six weeks *before* our 2018 World Congress on Regional Anesthesia and Pain Medicine, the #ASRAWorld18 hashtag already had nearly 2 million impressions.

ASRA promotes the use of social media to provide value for our members, including Facebook Live discussions from the exhibit hall and live chats with designated hashtags during specific sessions. A team of social media power users is assembled for each meeting to give attendees suggestions of who to follow throughout the meeting. Informal meet and greets in the exhibit hall provide a way for participants to meet—and often they do so as if seeing old friends again, despite having never been in the same room before. We understand the importance of providing value for your membership to ASRA, including through social networking such as this.

The *ASRA News* has a popular problem-based learning discussion feature in which a case scenario is shared on Twitter and people are encouraged to weigh in on how they would manage a patient's care. Later, the results are summarized along with opinions of selected physicians. By having these kinds of discussions, albeit virtually, we can learn from one another, expand perspectives, and raise awareness.

Asokumar Buvanendran, MD
ASRA President

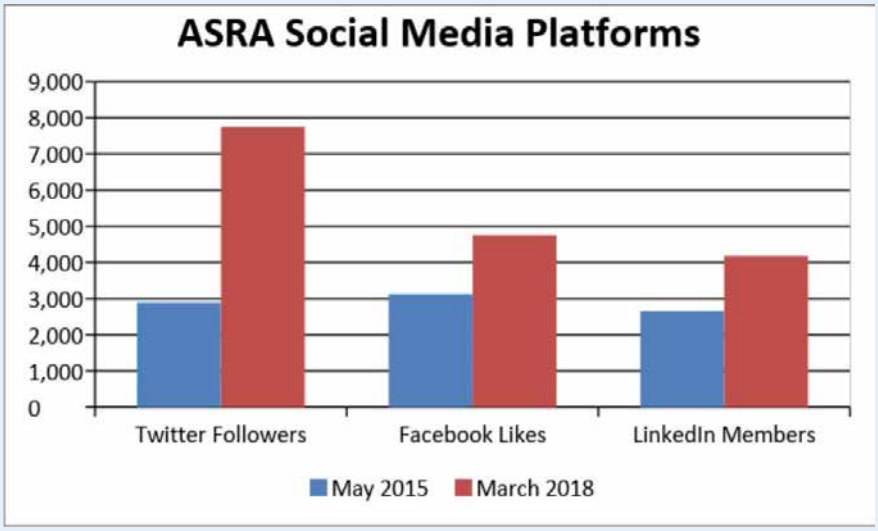
Social media also gives us a chance to just talk about ASRA. Where you used to have to write an e-mail or make a phone call, you can now post to @ASRA_Society, which then helps anyone else who thought it but didn't say it.

With all of its benefit for our ASRA members, we also have to be cautious about social media, just as we must be cautious about all of the technology attacking our senses throughout the day. For starters, it tends to make us feel things are more urgent than they really are. In 2013, Dr John Mandrola warned doctors on KevinMD.com that although technology moves at a fast pace, we must remember the permanency of digital media. "You are a doctor, not a journalist," he wrote. "You have time."[4]

"By having these kinds of discussions, albeit virtually, we can learn from one another, expand perspectives, and raise awareness."

Psychology and sociology experts have studied extensively the effects of social media on mental health and the relationship between reward centers in our brains and positive or negative responses to posts and notifications.[5] Facebook itself shared research in December 2017 indicating that active users had worse mental health than average and finding a connection between technology use and teen depression. However, that same report cited examples of studies that found a correlation between improved mental health and social media, indicating that more research is needed.[6]

For a busy doctor carrying around a cell phone that is constantly alerting him or her to new messages, reminders, Twitter chats, likes, followers, breaking news, and more, social media may be just another factor contributing to physician burnout. The constant need to be plugged in can take a toll on anyone, with smartphone addiction becoming a real condition and a National Day of Unplugging held each March aimed at helping all of us deal with that condition.



Physician burnout is a serious problem, and it's no stretch to think that our use of devices is a contributing factor for some people. So, although I encourage that we all take advantage of the benefits of social media to be better doctors, I would also like to remind you of the importance of unplugging now and then to also be a better doctor.

Check out ASRA's Twitter, Facebook, and LinkedIn pages, and read more about ASRA's social media activity at the 2018 World Congress on Regional Anesthesia and Pain Medicine.

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An Introduction and an Opportunity

Over the years, I have realized that ASRA is an organization committed to fostering involvement and opportunity for all members. ASRA has developed this spirit of inclusivity by serving as a voice for practicing anesthesiologists to demonstrate their skill and expertise. Anesthesiologists from a variety of practice models (eg, academics, private practice, international, residents) have the opportunity to share their unique perspectives and valuable experience. As I begin my term as editor, my goal is for the *ASRA News* to continue to be a conduit for ASRA membership involvement. To that end, I need your help! Please approach me in person at ASRA or other national meetings, via e-mail at kmschro1@wisc.edu, or on Twitter at @KristopherSchr6 with ideas regarding potential article topics and authors. ASRA members, this is your opportunity to guide content, and I welcome your involvement.

"My goal is for the ASRA News *to continue to be a conduit for ASRA membership involvement."*

Kristopher Schroeder, MD
ASRA News Editor

In this issue, ASRA members demonstrate the impact that they and you can have on issues such as climate change, global health resources, and gender equality. At the same time, this issue deals with issues of connectivity and highlights the articles judged by fellowship directors as the most impactful in the field of regional anesthesia and acute pain management in 2017. I really hope that you enjoy this edition of the *ASRA News*, and I look forward to working with you in the upcoming years.

Regional Anesthesia Articles of the Year, 2017

The field of regional anesthesia expands and improves thanks to the work of countless investigators who pour tremendous effort into crafting well-designed studies. Knowledge creation races ahead; every year, we have more and more to know. To support the increased pace of regional anesthesia research, in 2018, *Regional Anesthesia and Pain Medicine* is expanding from six to now eight issues per year. Staying up to date can be a challenge, requiring delving into multiple journals and selecting studies to read based on titles, abstracts, or peer recommendations. To assist your reading, we have conducted an informal survey of all United States and Canadian regional anesthesiology fellowship directors, asking them to identify the most important articles of 2017, excluding editorials.

None of the four top articles selected describes a novel technique. Rather, they use various methods to help guide care and block selection in common clinical conditions. This theme highlights the lack of agreement in the regional anesthesia literature around what constitutes optimal care or if one therapy can be shown to be superior to others. The methods employed in these articles also vary, including a randomized controlled trial (RCT), a large retrospective database analysis, a scoping review, and a network meta-analysis. Interestingly, the study design choices can result in different conclusions, as illustrated by the two total knee arthroplasty (TKA) studies selected.

Following are brief synopses of the selected top articles of 2017, in no particular order.

Auyong DB, Yuan SC, Choi DS, Pahang JA, Slee AE, Hanson NA. A double-blind randomized comparison of continuous interscalene, supraclavicular, and suprascapular blocks for total shoulder arthroplasty. *Reg Anesth Pain Med* 2017;42(3):302–309. https://doi.org/10.1097/AAP.0000000000000578

Auyong et al investigated the respiratory and analgesic effects of three different brachial plexus blocks for shoulder arthroplasty. They conducted a 75-patient RCT of continuous interscalene, supraclavicular, or suprascapular blocks, randomizing in a 1:1:1 ratio with 25 patients per group. The primary outcome was the assessment of vital capacity by spirometry after 24 hours of continuous nerve block infusion at 6 mL/h of 0.2% ropivacaine without an initial bolus. The continuous interscalene and supraclavicular groups had large decreases in vital capacity, with mean decreases of 991 mL and 803 mL, respectively. Differences between the interscalene and supraclavicular groups were not statistically significant. The continuous suprascapular group fared better, with a mean vital capacity reduction of only 464 mL, which was significantly better than either of the other groups. Secondary outcomes studied included diaphragm excursion by ultrasound, pain scores, opioid consumption, and adverse effects. Significantly decreased diaphragmatic excursion was identified in the interscalene group compared with the supraclavicular group ($p = .012$) and the suprascapular group ($p < .001$). Pain scores by numeric rating scale (2.2, 1.6, and 2.6) and 24-hour opioid consumption (13.8 mg, 9.9 mg, and 21.8 mg intravenous morphine equivalents) for groups interscalene, supraclavicular, and suprascapular, respectively, were not significantly different. Fewer adverse effects (ie, Horner syndrome, dyspnea, and hoarseness) were noted in the suprascapular group compared with the interscalene group ($p = .002$). The findings suggested that continuous suprascapular blockade can preserve pulmonary function for shoulder arthroscopy patients better than interscalene or supraclavicular approaches, without increasing pain or opioid use.

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Malekpour M, Hashmi A, Dove J, Torres D, Wild J. Analgesic choice in management of rib fractures. *Anesth Analg* 2017;124(6):1906–1911. https://doi.org/10.1213/ANE.0000000000002113

Malekpour et al explored the role of epidural analgesia (EA) compared to paravertebral block (PVB) in treating rib fractures via

a retrospective review of the National Trauma Data Bank (NTDB). More than a million records were screened, and patients were included based on the presence of an ICD-9 code indicating rib fractures. Patients were excluded for age less than 18 years or the presence of concurrent sternal, tracheal, or laryngeal trauma. A total of 194,766 patient records were selected, of which 1,110 received paravertebral blocks, 1,073 received epidural analgesia, and 192,583 received no interventions. Patients were then propensity matched twice (scoring the probability of receiving a PVB and probability of requiring any procedure) to eliminate potential confounding variables. This allowed two comparisons: (1) epidural versus paravertebral and (2) procedure (EA or PVB) versus nonprocedure. After 1:1 propensity matching, 557 patients in the EA and PVB groups and 1,114 patients in the nonprocedure group remained for analysis. No significant differences between EA and PVB were found regarding in-hospital mortality, length of stay (LOS), intensive care unit (ICU) admission, ICU LOS, duration of mechanical ventilation, development of pneumonia, or other complications. In contrast, the nonprocedure group suffered increased mortality compared with patients receiving either EA or PVB (odds ratio = 2.25; 95% confidence interval: 1.14–3.84). However, the procedure group experienced an increase in hospital LOS and more frequent ICU admissions. Study limitations included dependency on accuracy and completeness of data, the inability to evaluate for comorbidities from the procedures themselves, and the potential for selection bias (despite propensity matching) of more severely injured patients because of the characteristics of the hospitals participating in the NTDB.

Terkawi AS, Mavridis D, Sessler DI, et al. Pain management modalities after total knee arthroplasty: a network meta-analysis of 170 randomized controlled trials. *Anesthesiology* 2017;126(5):923–937. https://doi.org/10.1097/ALN.0000000000001607

Terkawi et al performed a network meta-analysis of 170 trials of analgesic regimens for TKA to evaluate efficacy and rank the various modalities available to control pain. A network meta-analysis aggregates study data across multiple studies in much the same way as a conventional meta-analysis, but instead of comparing two treatment arms, it seeks to use direct and indirect comparisons between multiple groups to stratify and rank treatments. Terkawi et al made comparisons between neuraxial analgesia, various combinations of peripheral nerve blocks, periarticular local anesthetic infiltration, auricular acupuncture, patient-controlled analgesia, and placebo. Trials included in the analysis spanned 30 years, represented 12,530 patients from 35 countries, and included 17 different treatment modalities. Pain at rest, pain with movement, opioid consumption, and range of motion in the first 72 hours after operation were used as primary outcome measures. As with other meta-analyses, the included trials varied in quality, risk of bias, patient population, and types of data present, as well as surgical anesthetic technique and adjuvant analgesic medications. The authors sought to rank the 17 identified treatments for each of the four primary outcomes using a surface under the cumulative ranking curve method of analysis to compare interventions against a theoretical optimal regimen. What emerged was a ranking of interventions. Their conclusions suggested that multiple nerve blocks work better than any single nerve block and are superior to neuraxial or periarticular techniques. The combination of femoral and sciatic nerve blocks was rated the best overall option, although that conclusion masks a great deal of nuance.

"The article should serve as an invaluable aid to those designing a total joint protocol or contemplating their institution's current practices."

Kopp SL, Børglum J, Buvanendran A, et al. Anesthesia and analgesia practice pathway options for total knee arthroplasty. *Reg Anesth Pain Med* 2017;42(6):683–697. https://doi.org/10.1097/AAP.0000000000000673

Kopp et al approached the complexity of literature surrounding analgesic options in TKA by structuring their investigation as a scoping review. This technique focuses more on describing the literature, in this case the breadth of analgesic options available for TKA, rather than providing any quantitative analysis. Although the expert panel that authored this study initially sought to define optimal practice and create a practice pathway, the approach changed when the heterogeneity in clinical practice became apparent. Instead, the authors compiled and evaluated the risks and benefits of currently available treatment options. Different modalities discussed included neuraxial anesthesia, general anesthesia, peripheral nerve blocks, local anesthetic infiltration, wound catheters, and various oral and intravenous analgesics. The TKA protocol goals are detailed. A sample TKA pathway is provided to illustrate integration of preoperative, intraoperative, and postoperative care. The article highlights the advantages of neuraxial over general anesthesia, and decreases in mortality; reduction of pulmonary, renal, and gastrointestinal complications; and improvements of length of stay and cost are discussed. The article should serve as an invaluable aid to those designing a total joint protocol or contemplating their institution's current practices.

Supporting Women in Regional Anesthesia and Pain Medicine (WRAPM): Why You Should Join the ASRA Special Interest Group

THE GENDER GAP IN REGIONAL ANESTHESIA AND PAIN MEDICINE

In 1965, fewer than 10% of medical students were female; now, more than five decades later, women comprise approximately half of all medical school graduates.[1] Despite the increased representation of women in the physician workforce, a significant gender gap persists in many medical specialties—including anesthesiology and particularly in the subspecialty of pain medicine. Although approximately 1 in 10 United States physicians is an anesthesiologist,[2] women comprise just 35% of anesthesiology residents and 22% of pain medicine fellows.[3] To place that into context, anesthesiology has a lower proportion of female trainees than internal medicine, physiatry, or surgery, and pain medicine has proportionally fewer female trainees than plastic surgery, thoracic surgery, or urology (Figure 1).[3] More importantly, the underrepresentation of women in our profession goes beyond the mere number of trainees and extends into every aspect of our careers, including compensation, awards recognition, and leadership positions (Figure 2). With the creation of the newest ASRA Special Interest Group (SIG), we intend to address this problem—together. Women in Regional Anesthesia and Pain Medicine (WRAPM) is a free SIG open to all ASRA members, men and women, interested in supporting and advancing the role of women in our subspecialties and medicine in general.

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WRAPM'S MISSION

- Encourage recruitment and promote the contributions of women in regional anesthesiology and pain medicine.
- Provide networking opportunities and professional development support for women in pursuit of ASRA's mission.
- Recognize the achievements of women in the field and understand the unique challenges that women in the profession face.

As one of the foremost professional societies in our specialty, ASRA is in a powerful position to effect positive change in the science and practice of regional anesthesia and pain medicine. Improving gender diversity will drive more innovative research, more comprehensive education, and more personalized patient care. When we encourage and promote the participation of women in our profession, we are helping ASRA to "accomplish our mission and vision by addressing the clinical and professional educational needs of physicians and scientists, ensuring excellence in patient care utilizing regional anesthesia and pain medicine, and investigating the scientific basis of the specialty."

To accomplish the shared missions of ASRA and WRAPM, we have proposed the following goals and objectives:

1. Provide a networking forum for women in ASRA to discuss and share ideas to enhance their professional development.
2. Provide mentorship, sponsorship, and support to women in the early phases of careers in regional anesthesiology and pain medicine.

Figure 1: *Gender composition of trainees in selected ACGME specialties, 2016.*[4]

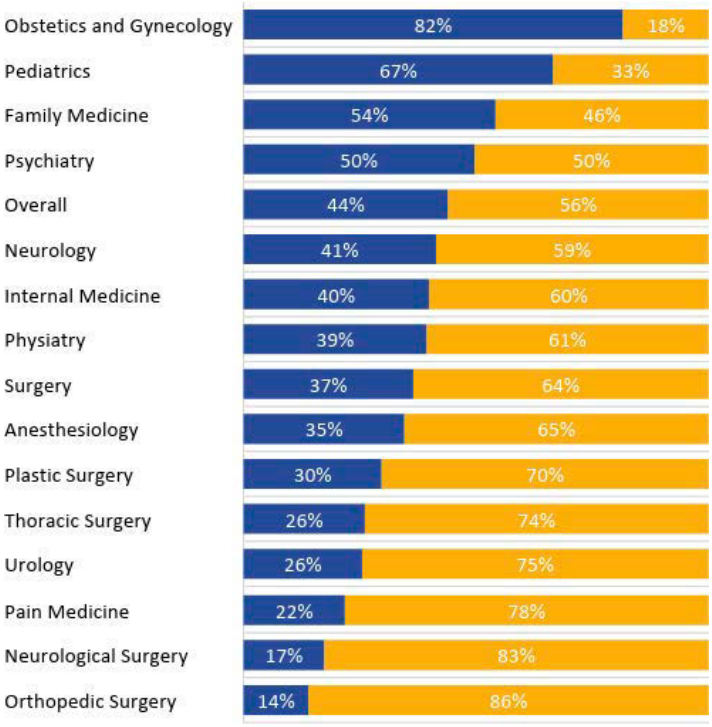
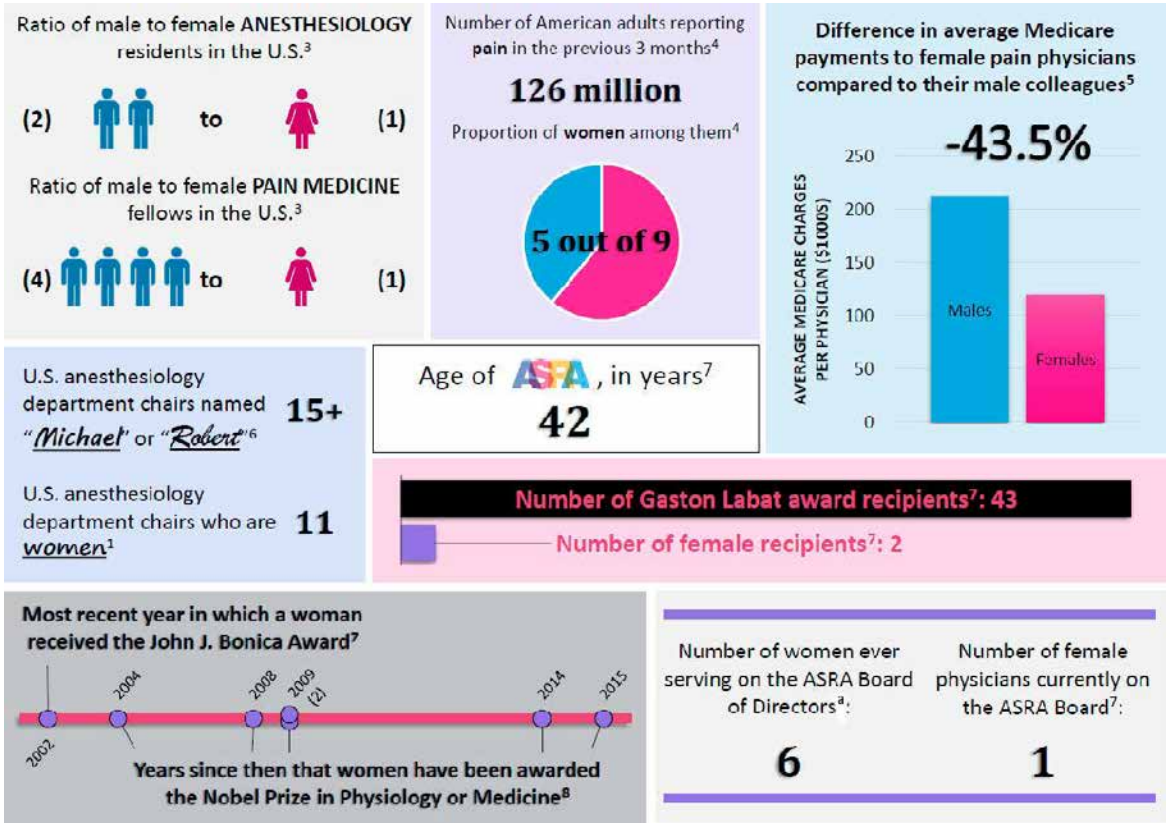


Figure 2: *Women in Regional Anesthesia and Pain Medicine: by the numbers.*



[a] ASRA Membership Services, e-mail communication, October 18, 2017

3. Offer specific leadership training for women, with an emphasis on developing a pathway for advancement in ASRA as well as individual academic and private institutions.
4. Support research projects from women in regional anesthesiology and pain medicine.
5. Increase participation of female medical students, residents, and fellows in the field.
6. Recognize and promote the work of women in advancing the field through education, advocacy, research, and patient care.
7. Advise ASRA on issues related to women in the practice of regional anesthesiology and pain medicine.

"The underrepresentation of women in our profession goes beyond the mere number of trainees and extends into every aspect of our careers, including compensation, awards recognition, and leadership positions."

HOW YOU CAN HELP

The WRAPM SIG aims to benefit all ASRA members, leveraging the excellent resources and tools that ASRA provides. We invite men and women at all levels of training to join us. We want to learn from our trainees and early career professionals what services and support we can provide to promote successful careers. We seek the mentorship and sponsorship of successful male and female physicians to help us identify professional development strategies that work and how we can use them to promote women in regional anesthesia and pain medicine. We want to learn from residency and fellowship program directors

about the barriers that prevent women from pursuing our profession, ways to address them, and steps we can take to encourage greater female interest. We need division chiefs, department chairs, conference organizers, journal editors, and awards committee members to join in the discussion on how we can elevate the profiles of women in regional anesthesia and pain medicine. We value the perspectives of our male and female advocates, sponsors, and mentors to understand how we can work together to improve gender diversity and effect positive change in our specialty.

In short, if you're an ASRA member, WRAPM needs your help—and wants to help you! Please join us, and together, we can create new opportunities to advance the role of women in regional anesthesiology and pain medicine. We can't wait to see all of you at our next meeting at the 2018 World Congress on Regional Anesthesia and Pain Medicine in New York!

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A Primer for Setting Up Your Professional Twitter Account

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WHY YOU SHOULD BE ON TWITTER

A common misconception is that social media is all about what someone ate for breakfast or other noneducational celebrity narratives. Twitter, as with other social media platforms, can be personalized to curate the vast amount of content available to feature a user's primary interests, such as anesthesiology research and clinical practice. Beyond creating an online community of followers who share recent publications, scientific news, and practice guidelines, active engagement on Twitter can promote dissemination of personal research interests or publications and networking with potential collaborators and mentors across vast distances. Avid anesthesiologist tweeters have published articles on the benefits of academic social media use,[1–3] and a recent ASRA blog post presents good reasons to use Twitter, including but not limited to those listed in Figure 1. Perhaps you're already convinced, but learning a new social media platform is understandably daunting. This article will help demystify and provide practical advice on creating and using a professional Twitter account.

CURATING TWITTER CONTENT

The content presented on users' news feeds is dictated by whom they follow. Following other Twitter users with public accounts is a straightforward process. Find another Twitter account by selecting the search magnifying glass icon and typing in a name. Another method to find other users is by searching for common interests, current events, or any specific topic. After following another user, the user's tweets will show up on your Twitter news feed. Owners of private accounts must approve each follow request first. You can follow as many accounts as you want, and you are not obligated to keep following. If the tweets are no longer of interest, you may simply unfollow the account. The account holder will not be alerted to your change of interest.

"Twitter can promote dissemination of personal research interests or publications and networking with potential collaborators and mentors across vast distances."

Another way to filter content and user accounts that show up on your Twitter feed is via lists. Any user can create lists, which are often grouped by topic. Lists can be made private or public. A public list allows any Twitter user interested in these topics to access it. Following a list enables you to track its recent activity without following each individual user account. This tool can help you keep up-to-date on multiple topics concurrently. For example, to browse new papers and posts in pediatric anesthesiology and critical care medicine, you can create two lists: one with mainly user accounts (including journals and professional societies) sharing an interest in pediatric anesthesiology and a separate list of critical care medicine accounts. Notifications can be set to alert you to new content, and a real-time breakdown of your lists is located on your profile.

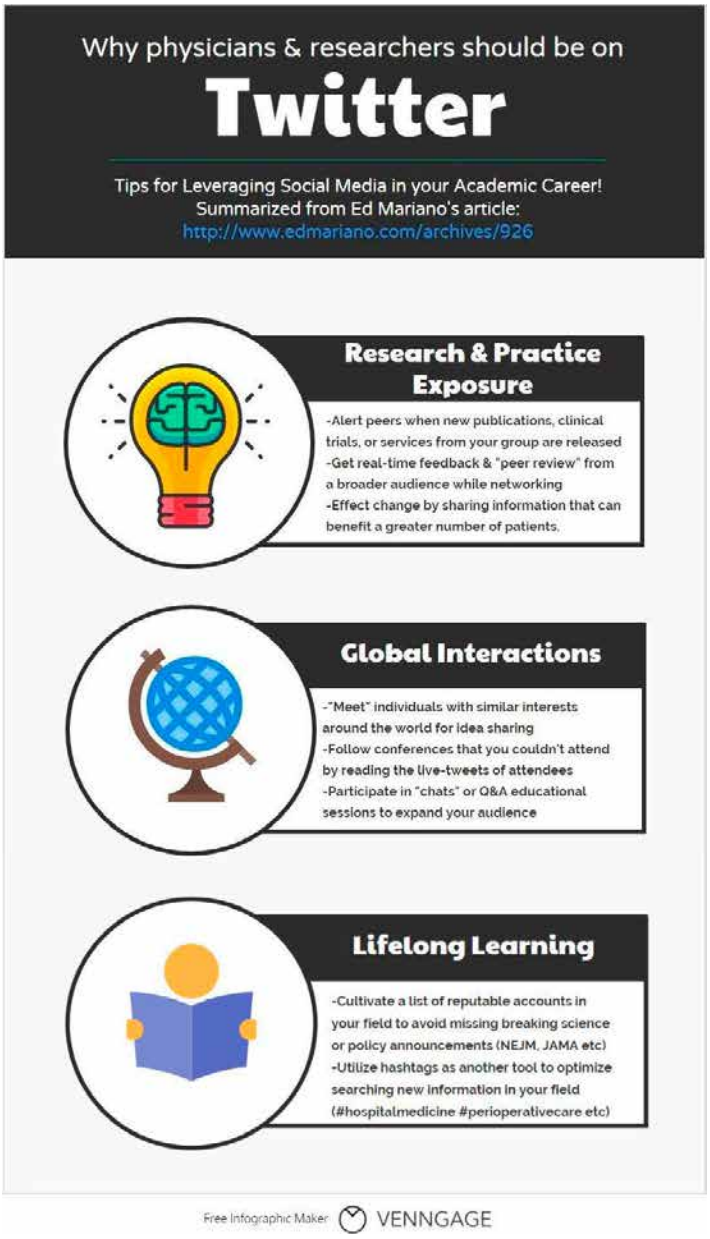
HASHTAGS AND HOW TO USE THEM

Hashtags, indicated by letters following the pound symbol ("#" and no spaces), are used to link topics, conversations like Twitter chats (eg, #AnesJC), or events such as scientific meetings (eg, #ASRAWorld18). Major sporting events and breaking news often have hashtags created, but anyone can make a hashtag on any topic. Multiple hashtags can be placed in a tweet, but don't overpopulate your tweets with too many hashtags. The search bar can be used to search for hashtags that describe a topic or event. Results can be sorted by most popular or most recent, allowing users to follow the conversation in real time. This is especially useful during scientific meetings or live chats on Twitter.

ACTIVE IS BETTER THAN PASSIVE

You are not required to tweet. Passive reading and following of users is a worthwhile way to use Twitter to keep up with topics that are important to you. However, we think that active tweeting

Figure 1: *Benefits of social media for physicians and researchers.*



is more fulfilling and potentially beneficial to your career. It goes without saying that professionalism is paramount, and no patient information or official medical advice should be tweeted. The debate on how much personal, nonmedical-related content should be shared is complex and ultimately a personal decision. Some users opt for multiple accounts: one anonymous or private, and one public and professional. Others engage differently according to the social media platform (eg, Facebook or Instagram for personal, Twitter for professional).[3] Regardless of approach, you should consider all social media posts and tweets as public, searchable, and permanent. Tweets may be deleted, but there is no way to know who or how many saw a post before it was removed.

Discussing recently published articles with experts in the field from around the world and discovering additional resources that would otherwise have been missed are serious perks of engaging in Twitter. Finding new mentors or collaborators is certainly possible, given the ease of connection and ability to explore a content range as narrow or broad as desired.

HOW TO BRING PEOPLE INTO THE CONVERSATION

You can engage other Twitter users, or "mention" them to provide credit in a quote or paper, by including their twitter handle (eg, @Neuro_Kellie) in your tweet. Similarly, you may reply to a tweet by clicking on the speech bubble just below the tweet on the left side. Anyone mentioned in that tweet will be included in your reply and receive a notification.

Twitter also allows users to add pictures to tweets. Infographics and visual abstracts can be powerful tools for users to highlight key points in a research article or presentation. Multiple journals have incorporated these methods to increase social media shares and page views. Dr Andrew Ibrahim, creative director for *Annals of Surgery*, created a step-by-step instruction manual for visual abstract creation that is freely available online. With an ever-increasing amount of data and complexity surrounding medicine and research, visual tools may promote interest, comprehension, and implementation.

To draw more attention to a tweet, a user can tag up to 10 other users per picture. This will give those accounts a notification about the tweet, which may generate engagement and lead to more page views and shares when applicable. Tagging can also be used with infographics and visual abstracts to give credit to graphic designers, article authors, journals, or professional societies.

ACTIVITIES TO LAUNCH YOUR PROFESSIONAL ACCOUNT

Two of the most rewarding and visible ways of engaging professionally on Twitter are Twitter chats and live tweeting at a scientific meeting or conference.

Twitter chats can be organized by anyone but require a designated hashtag, meeting time, specified duration, and publicity to make them successful. During the chats, a moderator will tweet one question at a time while using the chat hashtag along with the numbered question or topic (eg, Q1 or T1). Twitter chats are public, so anyone can contribute to the conversation. A great introduction to Twitter chats for anesthesiologists new to Twitter is #AnesJC, the Twitter journal club started by Duke Anesthesiology.[2] For a list of active Twitter chats in the health care field, visit Symplur.

Tweeting a meeting is the same concept as a Twitter chat but spread out over time and more free-form. Hashtags for medical

conferences are often registered with Symplur so analytics and transcripts can be created. As with chats, remember to include the designated hashtag. The general idea is to share the scientific content with those who cannot attend, initiate or participate in conversations about new data and clinical practice, and network with other practitioners. To this end, high-quality tweets often include pictures of slides, quotes from the speakers, summaries of data presented, links to original manuscripts referenced during talks, or thought-provoking questions. When sharing an important learning point, good Twitter etiquette suggests crediting the speaker(s) by including his or her Twitter handle when applicable. Consider adding your Twitter handle to your conference name badge to let others know you are on Twitter, and definitely make time to meet members of your community who are attending the conference in real life (ie, have a "Tweetup").

FINAL THOUGHTS

The use of social media in medicine and medical education is quickly expanding. ASRA has seen a robust response to its social media offerings, both at its annual meetings and during the time between them. Twitter is a powerful learning tool that allows engagement among peers and colleagues across wide distances. This can enhance patient care, medical knowledge, and mentorship. As the volume of new research and other information relevant to health care continues to expand at an exponential rate, we expect applications of social media platforms like Twitter in medical education to grow. We hope ASRA members realize the potential benefits and get engaged.

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Problem-Based Learning Discussion (PBLD): Pain Management in Patients Undergoing Mastectomy and Axillary Surgery

Editor's note: We encourage submissions of deidentified cases for discussion in future issues. Send cases to asranewseditor@asra.com. Would you like to share your opinions on cases? Send your name, practice setting, and contact information to asranewseditor@asra.com.

A 68-year-old woman presents for bilateral mastectomy with sentinel lymph node biopsy and possible axillary dissection. She suffers from hypertension, diet-controlled diabetes, obstructive sleep apnea, and obesity (120 kg, body mass index is 37). Medications include lisinopril and metoprolol. The patient's blood pressure is well controlled, her hemoglobin A1C is 5.6%, and she has been medically optimized by her primary care provider.

What multimodal analgesic plan would you normally use for this patient?

Warren: At my institution, the typical multimodal analgesic plan for this patient would include acetaminophen, opioids, and local anesthetic infiltration performed by the surgeon. Our surgeons typically instill local anesthetic through the drain and clamp the drain for an hour, after which the clamp is released. Patients are quite comfortable and do well. Our practice is to only perform paravertebral blocks for patients having additional immediate reconstruction, but on occasion for select patients we will also perform paravertebral or pectoralis nerve and serratus plane (PECS) blocks for simple mastectomy/axillary dissection. We also consider the use of perioperative gabapentin and celecoxib.

Pawa: At my institution, we have not implemented the preoperative administration of multimodal analgesics (acetaminophen, nonsteroidal anti-inflammatories, and gabapentinoids) despite having a large breast cancer caseload. I would therefore not administer anything preoperatively. My primary concerns here would be that her diabetes is controlled and that she omits her lisinopril on the day of surgery.

Feinstein: In the preoperative holding area, this patient would be offered a standardized oral multimodal regimen based on age and pertinent lab findings. The medications include gabapentin 800 mg (800 mg for those younger than 69 years and 400 mg for those older than 69 years); acetaminophen 1,000 mg; and celecoxib 400 mg (if GFR greater then 60 mL/min/1.73 m2, 400 mg for those younger than 69 years and 200 mg for those older than 69 years). The patient would also be offered a single-injection interfascial plane block prior to surgery.

What is your anesthetic plan for this patient? Do you need any additional information to formulate your plan?

Warren: I would like to have more information about the patient's functional status, and at least a recent echocardiography test to review. I would confirm that her blood pressure is well controlled

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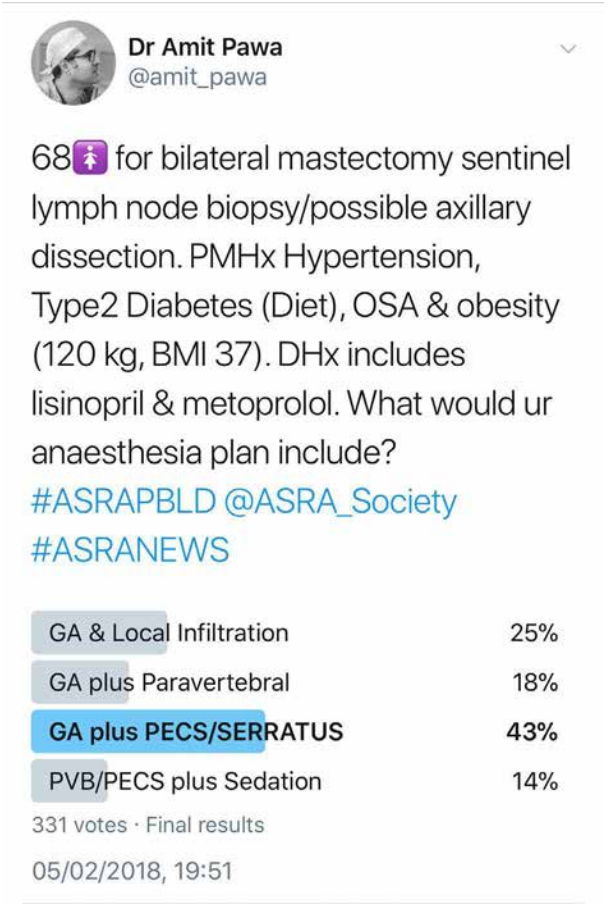

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and that she has no unstable cardiovascular symptoms and no evidence or history of congestive heart failure. If her functional status is limited, I would want to review a recent stress test or transthoracic echo. In addition, I would ask whether she uses continuous positive airway pressure (CPAP) machine regularly, and if she had any previous anesthetic-related issues or history/symptoms of significant gastrointestinal reflux disease. I would include a thorough exam of the airway and auscultation of heart and lungs in my physical assessment.

Pawa: I would use my standard practice for mastectomy and axillary surgery and perform general anesthesia maintained by total intravenous anesthesia with a target-controlled infusion of propofol. For this patient, I would intubate the trachea to secure her airway. Analgesia would be delivered by siting bilateral single-shot, single-level paravertebral blocks, possibly with the addition of bilateral PECS blocks. I would be keen to minimize administration of any opiates. Prior to siting the paravertebral blocks, I would like to know whether the patient was on any antiplatelet or anticoagulant drugs or whether she had any other potential contraindications to siting them. It would be useful to know the severity of the obstructive sleep apnea and her reliance on CPAP so that I could plan her postoperative destination. In all likelihood, I would request a high-dependency bed for her postoperative recovery. Finally, it would be useful to know how well her diabetes and blood pressure were controlled and whether she had any evidence of end-organ damage.

Feinstein: If no other information was revealed during a preoperative assessment, the patient would receive an interfascial plane block and general anesthesia with an endotracheal tube for this surgery. If the patient was not a candidate for regional anesthesia, a lidocaine infusion would be used throughout the case.

What pharmacologic agents would you choose for maintenance of general or monitored anesthesia?

Warren: My general anesthetic plan would be either total intravenous anesthesia with propofol or a volatile anesthetic with sevoflurane and possibly nitrous oxide. I might also consider using low-dose ketamine to potentially reduce opioid use. I do not use remifentanil infusions and rather administer a long-acting opioid during the case. Neuromuscular blockade would most likely be obtained with succinylcholine followed by rocuronium. A monitored anesthesia care (MAC) protocol might include low-dose propofol, midazolam, and fentanyl. Dexmedetomidine is another option during MAC, although not one that I personally use.

Pawa: My general anesthesia would be maintained by a target-controlled infusion of propofol, guided by a depth of anesthesia monitor such as the bispectral index. The choice of drug is largely based on the work from two studies.[1,2]

If the patient was amenable and motivated, I would consider using the propofol infusion as MAC. Our group has published our experience with this perioperative strategy.[3]

Feinstein: Unless she has significant comorbidities that warrant avoidance of general anesthesia, the patient would be induced with lidocaine, fentanyl, propofol, and succinylcholine. Our surgeons request that no long-acting muscle relaxants be used in the setting of axillary dissection. Dexamethasone would be given shortly after induction as prophylaxis for nausea. Anesthesia would be maintained with sevoflurane in an air-oxygen mixture. Near emergence, the patient would also receive ondansetron.

What regional anesthesia technique would accompany your planned anesthetic?

Warren: Given the patient's size, an ultrasound-guided paravertebral block may be challenging, although I would attempt it depending on the anatomy visualization. If paravertebral block anatomy is not favorable, then I would perform ultrasound-guided PECS blocks (I, II, serratus plane).

I would use bilateral, ultrasound-guided paravertebral blocks with an in-plane transverse intercostal approach (linear probe 6–13 mHz), depositing bupivacaine 0.5% with 1:400,000 epinephrine, 20 mL each side (total 40 mL volume). I typically perform only a single-level block between T2–T4. If the plan is to conduct surgery under a sole regional anesthetic technique, I would probably perform two level injections bilaterally at T2–T3, T5–T6 with bupivacaine 0.375% with epinephrine 1:400,000, with 10–12 mL at each site (total of 40–48 mL). If visualization is difficult, I would attempt a more oblique ultrasound probe position or consider a sagittal paramedian approach. Recognizing that analgesia may be incomplete for the axillary dissection, I might also consider the addition of a PECS II block (ie, ultrasound-guided PECS I, II, serratus plane block using either bupivacaine 0.25% or 0.375% with 60–70 mL volume).

Pawa: My practice is largely based on anesthesia for breast cancer. The block I site the most for mastectomy surgery is the thoracic paravertebral, and I routinely site bilateral blocks for bilateral surgery. I occasionally supplement with a PECS I or II block, depending on the surgery and the patient. It is my standard practice to site paravertebrals preoperatively under a small amount of sedation, usually a bolus dose of midazolam (1–2 mg), possibly with a small amount of intravenous fentanyl (25–75 mcg). All of my paravertebrals are ultrasound guided, and with patients of this size, I position patients in the semiprone position and use a transverse, in-plane approach to the paravertebral space with an 18g Tuohy needle. If performing analgesic blocks, I usually use weight-appropriate doses of 0.25–0.5% levobupivacaine.

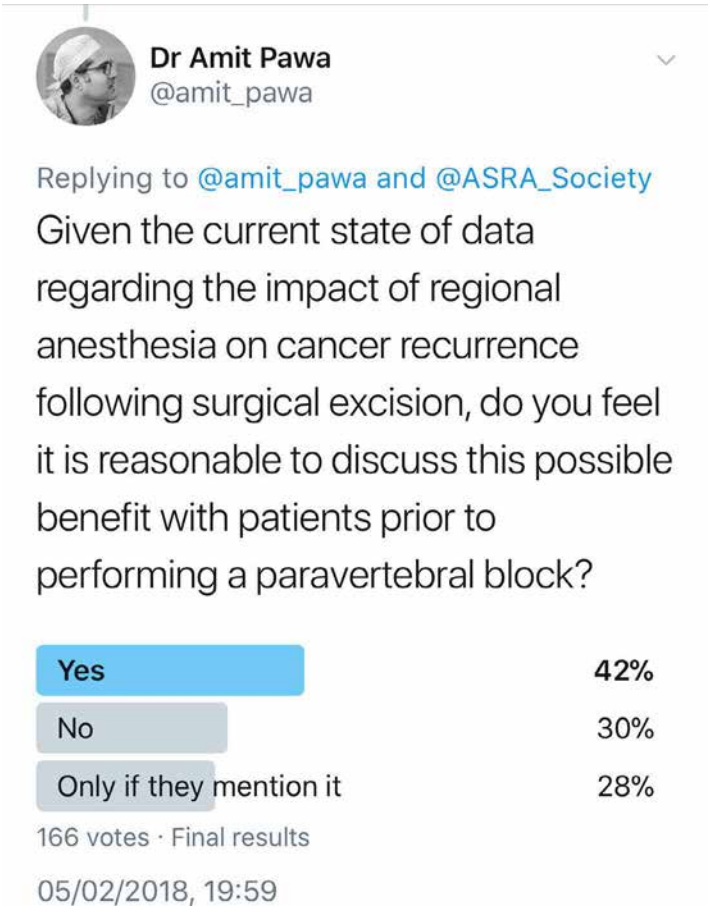
Feinstein: PECS blocks are offered preoperatively as our primary postoperative analgesic. The injection used for this block is 25 mL of bupivacaine 0.25%, with 2 mg of dexamethasone per side. One-third of the injectate is given between the pectoralis major and minor and two-thirds between the pectoralis minor and serratus anterior.

In our institution, patients receiving these blocks are routinely able to avoid intravenous opioids and often require minimal oral opioids in the first 24 hours. PECS and serratus blocks may offer improved analgesia, compared to other blocks for mastectomy, because of the unique blockade, which includes both lateral cutaneous branches of the intercostal nerves and some terminal branches of the brachial plexus. Some concern has been raised about the potential blockade of the long thoracic nerve when using PECS and serratus blocks, but our breast surgeons feel comfortable proceeding with the block. Additionally, PECS blocks are arguably easier to perform, faster, and safer than paravertebral blocks.

Would you consider insertion of a thoracic epidural as an alternative to paravertebral or pecs blocks?

Warren: Certainly, a mid- to high-thoracic epidural would be a good alternative to a paravertebral or PECS block; however the incidence of hypotension, motor weakness, and urinary retention is much greater than with a more peripheral approach. Pneumothorax is usually the risk that pushes many to prefer thoracic epidural over paravertebral block, but the incidence of pneumothorax, or clinically significant pneumothorax, is exceedingly low with a paravertebral block at my institution. Furthermore, recent publications have supported the low incidence of pneumothorax with ultrasound-guided paravertebral block.

Pawa: I would not consider siting a thoracic epidural in these patients for a number of reasons. First, I am an ultrasound convert, and it is difficult to site thoracic epidurals in real time with



ultrasound guidance. I also do not regularly site thoracic epidurals for any other parts of my practice, so it is a landmark technique with which I am becoming less proficient. Second, I believe that the risk profile associated with a landmark-guided thoracic epidural is worse than that of an ultrasound-guided paravertebral, especially in the obese population. Third and perhaps most significantly, if I consented my regular patients for an epidural for breast surgery, because of the stigma associated with epidurals, most patients would refuse to have one instead of either a paravertebral or a PECS block.

Feinstein: Thoracic epidurals are not used for mastectomy at our institution. Multiple concerns, including hypotension, urinary retention, pruritus, contraindications with blood thinners, and potential difficulties with ambulation, along with an inpatient requirement, have eliminated the technique from our practice.

Do you routinely use local anesthetic additives as part of your regional anesthetic?

Warren: I do not add adjuncts to my local anesthetic. Epinephrine is added as a vascular marker but probably does contribute to prolonging the duration of block effect as well.

Pawa: As a general rule, I do not use additives perineurally for paravertebral blocks. The only exception is when performing anesthesia for awake breast surgery. In those circumstances, I use lidocaine with epinephrine in addition to levobupivacaine to speed onset and reduce absorption. For most cases I administer intravenous dexamethasone, which I think has a beneficial effect despite the lack of evidence for paravertebral blocks.

Feinstein: Dexamethasone is a standard additive in our single-injection blocks. Meta-analysis of dexamethasone as an additive has shown an approximately 50–100% increase in duration of analgesia. Despite being off-label, dexamethasone has a long history of safe use in neuraxial as well as peripheral nerve blocks.

How do the patient's obesity and obstructive sleep apnea impact your intraoperative management plan?

Warren: Obstructive sleep apnea and obesity would probably spur me to use a regional anesthetic if this patient were undergoing a procedure at my institution that typically does not include regional anesthesia. It is important to recognize that obesity is likely to make a regional technique more challenging and may put patients at increased risk for pneumothorax. A good multimodal plan with local anesthetic infiltration and a balanced anesthetic can also work well.

Pawa: Obesity is not a problem restricted to North America and is certainly something that we are dealing with more frequently in the United Kingdom. The combination with obstructive sleep apnea focuses the mind and strengthens my resolve to use as opiate sparing a technique as possible. I mentioned previously that I prefer using a transverse, in-plane technique for paravertebral block insertion in obese patients. I would aim to avoid the perioperative administration of an intravenous opiate for either block insertion or intraoperative rescue. Instead, I would use bolus doses of ketamine for intraoperative rescue. I would also consider extubating the patient immediately onto CPAP to minimize problems in the postoperative period. If she were suitable for a general anesthesia-free technique (to have the surgery under blocks and sedation), I would consider the intraoperative use of her own CPAP or high-flow nasal oxygen.

Feinstein: Intraoperative management of patients with sleep apnea and obesity tends to focus on airway management, ventilation and oxygenation difficulties, and extubation. Using multimodal analgesics and regional anesthesia to minimize the use of opioids and other sedatives is valuable in decreasing the risk of respiratory compromise.

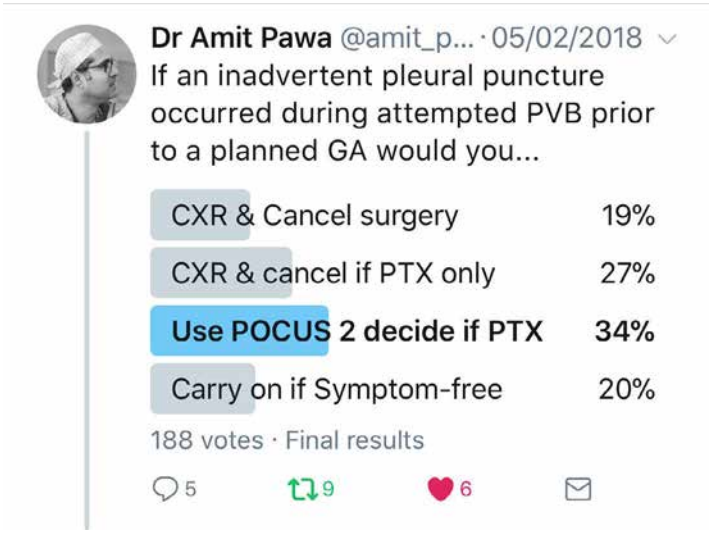
Your patient mentions having read that general anesthesia makes cancer recurrence more likely. How would you respond?

Warren: The jury is still out, and it appears that the avoidance or limiting the use of opioids may be the important factor in cancer recurrence.

Pawa: I would be honest and explain that presently, no definitive evidence backs up such a statement. Interest had been raised in breast cancer, based on some work performed 12 years ago.[4] The working hypothesis is that avoiding general anesthetic drugs and opiates and providing anesthesia via regional techniques using local anesthesia may retain the immune system's integrity and have an impact on reducing cancer recurrence. This is currently being investigated thoroughly via a randomized, multicenter trial, but at present no conclusive evidence exists either way.

Feinstein: Although animal models have shown some risk of recurrence with certain anesthetics, previously published retrospective human studies have not demonstrated conclusive results when evaluating the risk of recurrence and exposure to volatile anesthetic. Likewise, the theory that regional anesthesia may reduce the risk of recurrence has also not been proven, but ongoing studies will hopefully resolve these questions.

Following a thorough discussion with the patient, you agree to provide general anesthesia and perform bilateral paravertebral blocks at T3 and T5 with 10 mL 0.25% bupivacaine at each level to provide postoperative analgesia. After the last injection, spread of local anesthetic and needle tip location are noted to be subpleural. The needle is immediately removed, and the patient neither coughs nor complains of dyspnea.



In the setting of an inadvertent pleural puncture, how would you elect to proceed?

Warren: I would proceed with the procedure under sole regional technique.

Pawa: Most subpleural needle placements do not lead to pneumothorax. Also, intrapleural administration of local anesthetic is a recognized mode of analgesia (although not one I usually practice). I think that in the absence of cough or dyspnea, the sensible approach is to perform point-of-care ultrasonography to assess for pneumothorax (the absence of lung sliding or the observation of a lung point). If any doubt exists, a chest x-ray can also be performed.

Feinstein: After a known pleural puncture, the patient's lungs would be examined with ultrasonography and chest x-ray to look for a pneumothorax. Although ultrasonography has been shown in some studies to be more sensitive in diagnosing a pneumothorax, a chest x-ray can determine the extent of pneumothorax and help dictate care from the percentage of pneumothorax.

Additionally, pleural puncture does not always lead to pneumothorax. If the needle is not open to room air and there is no insult to the parenchyma of the lung, then a pneumothorax is unlikely to occur.

Assuming chest x-ray and/or ultrasonography fail(s) to demonstrate any pneumothorax, would you proceed with the planned general anesthetic?

Warren: This becomes a bigger discussion with the surgeon and the patient. If there is no evidence of pneumothorax (sonographic or radiographic assessment), then I would proceed with the planned general anesthetic, keeping in mind that positive pressure ventilation may create a pneumothorax during the surgery. Possible options include placing a prophylactic pigtail chest tube preoperatively, proceeding with surgery with a plan to place the pigtail tube (or chest tube) intraoperatively if it becomes necessary, or rescheduling the case.

Pawa: Yes, I would elect to proceed with the planned anesthesia and surgery.

Feinstein: If the patient remains asymptomatic, we would proceed to the operating room with increased vigilance for the possible development of intraoperative pneumothorax. To lessen the risk, we would avoid nitrous oxide and maintain spontaneous ventilation.

You elect to proceed with the case and it is conducted uneventfully. Four hours following the block, the surgical team asks if to inject a local anesthetic into the wound and, if so, how much. How do you respond?

Warren: I would ask the surgical team members what they are trying to accomplish. Paravertebral block duration usually exceeds the local infiltration duration. However, if they feel strongly about wound infiltration, I would ask that they avoid injecting into a blood vessel and use bupivacaine 0.25% with epinephrine (to reduce vascular absorption) up to 40–50 mL. I would request a smaller-volume injection if the patient has a reduced ejection fraction or hepatic or renal insufficiency.

Pawa: I am not entirely sure why the further injection of local anesthetic into the wound would be necessary after insertion of bilateral paravertebral blocks, unless there was axillary wound extension and I had not performed PECS blocks. As a result, although it is theoretically possible, I would ask them to refrain from injecting any further local anesthetic.

Feinstein: The surgical team may use additional local anesthetic. The dose depends on the amount used in the preoperative block, time since the preoperative block, and the patient's risk factors for toxicity (eg, heart and liver failure, age, weight). We would direct the surgical team to address the areas at risk for insufficient coverage from the paravertebral blocks (eg, axilla). We use a maximum of 3 mg/kg in a 4-hour time frame before considering additional local usage.

The patient is extubated uneventfully and taken to the postanesthesia care unit. You are called to evaluate her for 8/10 bilateral axillary pain. How would you evaluate and manage?

Warren: A physical exam is necessary to make sure that no physical reason is causing pain (eg, bleeding, hematoma development, arm ischemia, nerve compression) and to determine the actual site of pain.

Sensory innervation of the axilla is supplied by the lower brachial plexus (C8–T1–medial cutaneous nerve of the arm) and may not be covered with a paravertebral block, although it is not uncommon for cervical spread of local anesthetic with a paravertebral block as evidenced by frequent development of Horner syndrome. The medial arm/axilla is also supplied by the intercostobrachial (T2) nerve, which should be covered with a paravertebral block. A PECS II block can usually cover the intercostobrachial nerve successfully, but a brachial plexus block that covers the medial cord is necessary to block the medial cutaneous nerve of the arm. The superficial cervical plexus (supraclavicular nerves) may also contribute to sensory innervation of the axilla and anterior chest. I would consider performing additional blocks to cover what might have been missed.

Pawa: I would take a pain history and examine the patient to assess the cause of pain. I would also ask for a surgical consult. The possible differential diagnoses for pain would be surgical site pain because of inadequate scar analgesia in axilla (PECS block was not performed), pain from transection or electrocautery to intercostobrachial nerve, acute hematoma formation, and nonsurgical site pain from excessive shoulder abduction. If a PECS block had not been performed, I would clamp the drains for 30 minutes and perform bilateral PECS II blocks. If a PECS block had been performed, I would attempt to administer small intravenous boluses of ketamine or to instill local anesthesia via the drains.

Feinstein: After evaluating the patient at bedside and confirming the bilateral axillary pain, we would order PRN opioids as well as a single-dose intravenous ketorolac.

What could you have done to prevent the patient's significant axillary pain?

Warren: I could have performed a low-dose brachial plexus block (low interscalene, supraclavicular, or infraclavicular approach) to cover the medial cutaneous nerve of arm, although I would be wary of causing phrenic nerve paresis in an obese patient with obstructive sleep apnea (interscalene and infraclavicular blocks). An infraclavicular block is also challenging in morbidly obese patients. Alternatively, I could have done bilateral PECS II/intercostobrachial nerve block to cover the axilla or possibly bilateral superficial cervical plexus blocks.

Pawa: Depending on the cause, a number of options are available. Insertion of preemptive PECS blocks would be my first choice. The other potential strategies are preoperative administration of a gabapentin, not cutting the intercostobrachial nerve, or infiltrating the axillary wound with local anesthesia as the surgeons suggested.

Feinstein: In our experience, the PECS and serratus blocks enable better axillary analgesia. These interfascial plane blocks provide brachial plexus blockade that is missed when a paravertebral or epidural is used.

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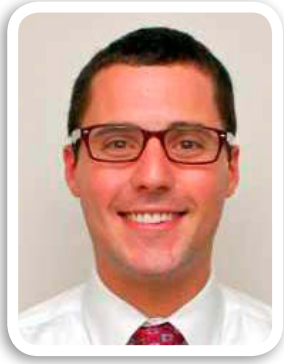
Rebound Pain After a Nerve Block Wears Off



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The benefits of regional anesthesia are well known and include reduced postoperative pain, decreased perioperative opioid administration, and improved patient satisfaction. Following block resolution, rebound pain has been recently recognized as an important complication related to the administration of peripheral nerve blocks.[1]

Rebound pain is the quantifiable difference in pain scores when a peripheral nerve block is working versus the acute pain that is encountered when the block wears off.[2,3] Rebound pain is often considered out of proportion to the degree of the surgical stimulus, and it may lead to an increased use of opioid analgesics and decreased patient satisfaction, thus undermining the perceived and real success and benefits associated with regional anesthesia.[4] This article aims to describe the phenomenon of rebound pain, its prevalence in the literature, and a suggested standard for reporting. In addition, potential etiologies and strategies to prevent and/or minimize rebound pain severity will be presented.

A recent qualitative study involving ankle surgery found that rebound pain following block resolution is a real concern to patients.[5] Although the patients appreciated the mental alertness and analgesia that the nerve blocks provided, they experienced difficulty predicting their analgesic needs following dissipation of these blocks and how to effectively prevent or manage rebound pain. As such, handling these intensely painful moments, especially with the potential for occurring outside of a health care setting, constitutes a clinically relevant problem.[5]

"Handling these intensely painful moments, especially with the potential for occurring outside of a health care setting, constitutes a clinically relevant problem."

Rebound pain occurs across a variety of surgeries, nerve blocks, and local anesthetics and has been corroborated in animal models. A 2015 meta-analysis found that rebound pain may render single-shot interscalene blockade less beneficial to patients undergoing ambulatory shoulder surgery than previously believed.[6] The patients had improved pain control up to 8 hours and an opioid-sparing effect up to 12 hours following surgery as compared to those receiving no block. However, the patients who received the block reported increased pain 16 hours postoperatively (1.16 on a 0–10 pain scale, 99% confidence interval [CI]: 0.02–2.30, $p = .009$), with no difference beyond 24 hours. The rebound pain as the block wore off was consistent across the meta-analysis, regardless of local anesthetic type, volume, or concentration used.[6] With the exception of epinephrine, adjuvants capable of prolonging the single-shot block were excluded from this study.[7]

In patients undergoing anterior cruciate ligament reconstruction, single-shot femoral nerve blockade resolution led to an associated acute increase in pain scores (2.0 on a 0–10 pain scale, 95% CI: 1.6–2.4, $p < .05$). Although increased nerve block duration (ie, femoral catheter infusion vs single-shot block) reduced the severity of rebound pain, it did so at a clinically insignificant rate: 0.03 units on a 0–10 pain scale per hour of block duration (95% CI: 0.02–0.05, $p < .001$).[2] In other words, 33 hours of a nerve block duration difference led to a rebound pain reduction of 1 (on a 0–10 scale).

Other studies have shown that certain regional techniques and surgeries pose a higher risk for causing rebound pain. Following total knee arthroplasty, periarticular injections provided greater immediate analgesia, yet more rebound pain, than did femoral nerve blocks or the combination of both blocks.[8] Unpublished data from our group also showed that associated rebound pain was higher after shoulder surgery than after complex knee surgery.[2]

Rebound pain has also been demonstrated in animal models, although the clinical relevance of these findings is uncertain. In one study, rats that underwent sciatic nerve blockade with ropivacaine were found to have transient hyperalgesia to heat stimuli (but not mechanical stimuli) as the block wore off (at 3 hours) as compared to rats receiving placebo blocks, suggesting a potential nerve fiber specificity in the pathophysiology of rebound pain.[9] Transient heat hyperalgesia was also found in a separate rat study at the 4-hour mark.[10] In rat studies, these interval findings regarding nerve block duration and rebound pain could translate to hours of comfort then discomfort for our patients.

Figure 1: *Proposal for standardized reporting of rebound pain scores (RPS) after peripheral nerve block resolution in outpatients.*[2,17]

Premises for Measurement of Rebound Pain

- RPS is a more precise outcome measure than nerve block duration, because exact nerve block duration may be difficult for the patient to specify.
- Patients should be encouraged to take oral multimodal analgesics on a regular schedule (or have them immediately available) to prevent moderate-to-severe pain at home.
- Specific pain scores should be assessed with movement, and the movement should be standardized to an activity of daily living early in outpatient recovery that involves movement of the surgical site (eg, ambulation to the bathroom, sponge bathing).
- Nerve block analgesic effects may take hours to gradually resolve. This variability is expected and is adjusted for by assessment of numeric rating scale pain scores before and after blocks resolve.

Measurement, Associated Patient Counseling, and Research Goals

- Time of nerve block resolution (from the patient's perspective) is estimated by the need for rescue oral analgesics (in the setting of a standardized movement), and/or absence of numbness or heaviness in the area affected by the nerve block.
- Time of nerve block resolution is recorded as the patient answering "no" to the question: "Is the nerve block providing pain relief?" and being able to describe the time it wore off.
- Patients can be advised to compare their RPS scores to the pain scores encountered with movement of the surgical extremity before surgery. This may lead to less catastrophizing in comparison with framing RPS against a zero pain score when the block is working.
- Dose-response research is needed to evaluate RPS as influenced by perineural adjuvant doses (eg, dexamethasone 1 mg versus 2 mg; buprenorphine 150 mcg versus 300 mcg) and/or local anesthetic concentrations (eg, bupivacaine 0.125% versus 0.25%).

With the increased attention and research that has evaluated rebound pain, several patterns have become apparent. Typically, rebound pain occurs 16–24 hours postoperatively, is experienced commonly at night, and negatively affects quality of sleep. Patients also commonly describe rebound pain as a burning sensation. Rebound pain can profoundly impact the patient recovery experience and ultimately affect overall opioid consumption, emergency department visits, and patient satisfaction.[5,11]

To better quantify this problem, Williams and colleagues[2] have proposed a standardized method of reporting rebound pain scores (Figure 1). Given the clinical implications, it is necessary to understand the pathophysiology of rebound pain as more than just the resolution of the nerve block. Although early animal models have pointed to potential modality- and nociceptor-specific mechanisms, other potential processes have emerged.[9]

Local anesthetics are widely known to be neurotoxic and may be the source of neuronal damage or altered conduction that could manifest as rebound pain.[12] Another theory proposes that although nerve blockade prevents signal transduction, nociceptive signal memories are retained and amplified when the block ultimately wears off.[11] Patient noncompliance or confusion can lead to poor transitioning from nerve block to oral analgesics.[13] Finally, patients may have catastrophizing misconceptions about the block, worry about permanent nerve damage, or develop a falsely low pain tolerance.[5] Acute opioid-induced hyperalgesia (ie, from either opioids used in the operating room or before the block wears off) is another hypothesis that we introduce here.

Regardless of cause, potential methods may minimize the effect of rebound pain on patients undergoing peripheral nerve blockade. Regional anesthesiologists can supplement their blocks with preoperative, intraoperative, and postoperative multimodal-enhanced, recovery-driven protocols with oral and intravenous analgesics.[11] This method may help cover the transition period as the nerve block wears off. Additionally, if local anesthetic concentrations are what drive the severity of rebound pain in vivo (yet unstudied) for blocks that are combined with a general anesthetic and intended to be used more for analgesia than surgical anesthesia, lower local anesthetic concentrations could be used in combination with perineural adjuvants.[14] When general anesthesia is required, two strategies are avoiding use of hyperalgesic agents such as volatile gases and short-acting opioids and including use of agents that modulate the pain response such as esmolol.[15,16]

Rebound pain can also be theoretically attenuated by prolonging the duration of the block, whether through the use of a continuous infusion via peripheral catheter or long-acting, single-shot injectates. In theory, this could reduce the inflammation and

retained neuronal memories associated with surgery. However, as previously discussed, the duration of analgesia must be significantly longer than a typical single-shot block to become clinically effective in reducing rebound pain.[2,11] Unfortunately, the expected rehabilitation plan and patient preferences may not allow for an extended period of motor blockade or diminished sensation.

Adjuvants may also play a role in decreasing rebound pain. Such drugs not only prolong the duration of the local anesthetic but also may modulate the block in a way that decreases rebound pain through other unknown mechanisms. A recent case series of perineural adjuvants found that a combination of clonidine, buprenorphine, and dexamethasone was associated with reduced severity of rebound pain when administered with bupivacaine or ropivacaine, although optimal dosing is still unclear and varies with extremity.[14,17] Specifically, more buprenorphine was associated with less rebound pain, whereas less dexamethasone was paradoxically associated with less rebound pain. In this case series, however, rebound pain was compared with preoperative pain scores with movement, which may prove to be a more useful parameter than when the block is fully functioning.[17]

In the end, educating patients may prove the most useful short-term management strategy. Including rebound pain during the risk–benefit discussion during the preoperative assessment can inform patients regarding what to expect when the block wears off. Baseline pain evaluations and psychological counseling for high-risk patients may be beneficial.[3] Patients and caregivers can also be instructed to stay ahead of the pain by taking long-acting analgesics while the block is still working.[11] Common formulations such as gabapentin, acetaminophen, ibuprofen, and dextromethorphan may prove useful as rescue medications for rebound pain.

Although the concept of rebound pain requires consideration and discussion, patients still express overall satisfaction from their nerve block experience.[5] Therefore, the multiple benefits of regional anesthesia make this a technique that should continue to be offered until further research can provide more clarity.

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Dealing With the Difficult Patient

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Pain is the subjective interpretation of nociceptive input: an objective, noxious stimulus that is processed through the lenses of a patient's particular affect and circumstances to generate both a perception and a behavioral response. The extrasomatic filters that make each patient unique can also generate some of our greatest therapeutic challenges. But, when does a patient transition from being a challenge, where he or she can still be rewarding to treat, to being outright difficult to work with? This article will address what may make a patient encounter difficult, identify factors attributed to the patient and the practitioner that interplay in such a situation, and suggest strategies that can mitigate most instances so that the encounter can have some positive influence in patient management.

Webster's New World Dictionary defines difficult as (1) hard to do, make, change, manage, understand, etc.; (2) involving trouble or requiring extra effort, skill, or thought; or (3) hard to satisfy, persuade, please, etc.[1] This is clearly a broad term open to interpretation, yet certain patterns emerge that many of us routinely encounter. Have you dealt with any of the following patients?

- The patient with multiple (convenient) allergies to many pain medications except meperidine or a drug of their apparent choice
- The patient with the superior mesenteric artery restricted-by-ligament compression who has high opioid requirements and lots of family "support"
- The patient with an opioid-only agenda ("I've done all you asked and it hasn't worked, so give me that prescription for an opioid.")
- The patient who vents at you for all the abuse he or she has suffered in the health care system and tells you the entire story
- The yeller whose volume and ferocity only increase as you decline repeated requests for a special test, drug, or disability rating
- The patient who refuses to follow your advice for more investigation (eg, seeing the disability specialist or the pain psychologist)
- The patient who perceives disability but does not qualify administratively or legally
- The chronic appointment canceller who is noncompliant and disruptive when he or she does show

Although many patients can be difficult to treat, what is distinctive about patients with chronic pain? Chronic pain lingers, which breeds failed expectations for treatment leading to cure among physicians and patients alike. Frustration agitates the doctor–patient relationship, where discussions leading to evaluation or treatment decisions intensify and judgment and biases become evident. Over time, patients adopt a belief that they are entitled to certain tests, medications, allowances from work, among others. Patients can develop (1) maladaptive changes in their attitudes about ever regaining their health, (2) nonproductive and even obstructive behaviors, (3) self-destructive lifestyles, and (4) physioanatomic changes in the pain-processing and transmission system, termed *neuroplasticity*, that essentially hardwire the pain response pattern. Chronic opioid use and neuropathic pain independently lower the set point threshold in the central nervous system for a response to nociceptive input, such that patients with longstanding pain or opioid use have an increased likelihood to experience pain from a remarkably low stimulus intensity.

Pain catastrophizing can pose an added degree of difficulty for patients and practitioners, so it must be identified in order to provide relevant therapy. In the introduction to a special issue of the *Journal of Applied Behavioral Research* on pain catastrophizing, Gatchel defines this as "an exaggerated negative orientation toward actual or anticipated pain experiences. . . . Current conceptualizations most often describe it in terms of appraisal or as a set of maladaptive beliefs."[2] Pain catastrophizing influences the severity of pain (both acute and chronic), the patient's functional disability and quality of life, the incidence of depression, and the patient's reported pain intensity. Brain imaging studies have shown that this phenomenon has an organic basis, because pain catastrophizing can affect activation of different cortical regions during pain-inducing manipulations.[2]

In medical school, we have been trained to interview patients to obtain their history; process the history, physical exam, and lab results; collate those data with literature and consultation; and provide feedback to patients about the working diagnosis and differential diagnosis. However, studies have shown that empathy (the appreciation for what the patient is going through) starts to drop when third-year medical students begin to get actual patient contact.[3] A difficult patient becomes particularly challenging in the setting of waning empathy. What can help is accruing experience

listening carefully to patients, sitting down rather than standing at the bedside, not interrupting patients, maintaining eye contact, asking patients how you can specifically help them today, and dealing with patients' emotions—all to establish a resilient doctor–patient relationship that can withstand the future need to deliver controversial or disappointing news.

The psychologist A. J. Mariano[4] provided advice in 2017 for dealing with difficult patients. His primary focus was answering whether pain physicians should reinstate opioid prescriptions in patients who had been successfully weaned off the medications, but the principles have broader application. Mariano noted that learning self-management strategies is difficult for patients and most patients have an opinion about what physician-active treatment is needed next. Yet, treatment must always be safe, logical, and sustainable.[4]

In making treatment decisions, patients must be advised to consider their other life problems even while we are trying to treat their pain—all that's wrong in their life isn't only their pain.[4] Our responsibility is to get patients the help they need as opposed to what they think they want (eg, getting more tests, seeing other specialists, having their medication dose increased). Mariano[4] recommended not responding to their accusations; the reality is, we are making recommendations, but it is a patient's responsibility to make choices. If a patient starts making threats, the best course is to document and explain our rationale for seeking advice from other colleagues or services. If you are very truly uncertain what action to take, then seek consultation for yourself at the time when you believe it is the right action, even if the patient disagrees. The bottom line is to err on the side of safety, patient education, and support, despite the patient's ardent passion.[4]

"The bottom line is to err on the side of safety, patient education, and support, despite the patient's ardent passion."

Beware of patients who perceive that you promised medications, particularly an opioid, only if they will try other modalities first. Those patients may attempt to "wait you out" and often offer (plausible, at least to them) reasons why they could not comply with the alternate options. We must appreciate, too, that patients will interpret clinical responses differently. A patient whose pain has not improved after three opioid dose escalations will continue to voice that the "right" dose simply has not been reached yet, whereas we see that as a pain that is not opioid responsive.

Looking toward the future of health care, Mandelbaum[5] emphasized that it would behoove us to remember five important principles. Per the Hippocratic oath, "I will prescribe a regimen for the good of my patients according to my ability and my judgment and never do harm to anyone."[6] The goal of health care is to keep healthy people healthy and take care of those who are not. Adapting his ideas to pain management, we should empower patients with a single source of information (grounded in our pain practices from which consistent information is generously provided to patients and families), expand access to care (recommending necessary consultations to expand the database upon which treatment decisions will be made and referring patients to centers for specialized procedures), centralize care in centers of excellence (using pain specialists, even if across state lines), and optimize technology (in the evaluation and the treatment phases of care). Finally, Mandelbaum adds that "politics should not determine how we care for people in need."[5] We are well aware of how unsettled the current health care climate is, where patients worry about insurance coverage for needed therapy and access to necessary care mandates. Mandelbaum is correct in saying that "patients need to be served" and pondering whether the Affordable Care Act is patient or even physician centered.

In the end, we truly need to manage neuropathic pain, as we do for diseases such as diabetes and asthma, because curing chronic pain is exceedingly difficult. Neuropathic pain exists at the intersection of physical and psychological pathology, which compounds the task of management. We need patients who are active in the evaluation process, management planning, prescription phases of care, and provision of physician feedback. Engaged, insightful patients can be helped more than those who demonstrate learned helplessness or passively wait for the doctor to fix all of their problems. Placing the burden for improvement entirely on the physician is naïve and nonproductive, but this demeanor can be induced by pain-related anxiety and depression. Thus, ongoing patient education and re-evaluation are major, ever-present responsibilities of the pain management practice. Establishing a clear and correct diagnosis is uniformly paramount, because it is essential to treat the underlying cause of the pain rather than addressing only the symptoms.

Factors that lay a solid foundation for success in the doctor–patient relationship include taking time to understand and address concerns from the patient's perspective.[7] With this mind-set, the goals of chronic pain treatment plans should include ensuring that patients perceive that their needs are taken seriously, feel educated about their pain syndrome and about available treatments, understand their diagnosis and the rationale for the treatment or action plan, endorse that treatment is lessening their pain symptoms over time, and establish that they are able to live with residual pain. Ultimately, patients should feel that the negative impact of pain on their ability to function in life is lessening. Early in

the treatment course, it is imperative to establish mutually agreed upon, realistic goals and expectations of pain management as an index on which to base conclusions about success of management.

From the physician's perspective, the goals of chronic pain management should be to decrease the frequency and/or the intensity of pain over time, while increasing patients' ability to function physically, emotionally, and cognitively. If needed, contemporary medications should be used, but the therapeutic approach must be broadened beyond just pharmacologic management, given the disease concept of neuropathic pain. We should help patients cope with residual pain and pain-related issues (eg, worker's compensation, disability determinations, legal matters).

Most patients will see even a slight decrease in their primary pain once a treatment program is started. This is a crucial achievement because it demonstrates that something can indeed be done about the pain that has previously only been worsening. This element of progress, no matter how small, must be constantly presented to patients to engage their continued participation in the program. Realistically, it can be very exasperating to confront only a negative reaction to this good news in difficult patients.

The bottom line is that many patient-specific and circumstantial challenges are inherent in treating patients with chronic or neuropathic pain. Major differences in the agenda between physicians and patients must be actively dealt with at every visit to align the expectations of management. Repetitive education that frequently involves explaining what you are doing and why is necessary for patients that may have low health care literacy.

Even with good therapeutic alliance and patient education, we need to increasingly understand complex intricacies of polypharmacy in the face of patient-specific pharmacogenomics. It is difficult enough at the present time to get a genuine drug trial that generates solid, objective data in medically complex patients, because they change their compliance with the recommendations. Our approach may be one drug or one dose change at a time, yet patients make independent decisions about efficacy, based on too-short trials, so time is wasted in modifying the treatment plan.

Understanding all of these challenges in the concurrent setting of your hospital's or practice's systems arrangements can add a further layer of complexity (eg, the availability of a particular drug or specific therapy, a primary care provider who will not write for a drug in the patient's home area, a patient who is denied formal rehabilitation).

In the end, it is important to remember that just because something is difficult to do does not mean it is not worth doing. Pain physicians can manage difficult patients when they have established policies about refill prescriptions, acceptable behavior in the office, no-show events, and late-to-appointment episodes. Difficult patients should have specific times to call and visit the office to stabilize the contact rules of engagement. Patients and their family members deserve direct, honest dialogue in language they understand and need help in sorting through the myriad sources of medical information available in the today's media world. Perhaps the most assured technique to assess what patients actually understand from your visit is to ask that they repeat back to you what you have discovered/discussed/agreed upon.

We are obligated to share our expertise with all patients, even those designated as “difficult.” Using a systematic, straightforward approach, even these patients can be served.

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Truncal Blocks for Cesarean Pain: Filling a Void in Obstetric Pain Management

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CESAREAN SECTION PAIN

Approximately one-third of all neonates in the United States are delivered by Cesarean section. The most common indications include elective repeated Cesarean delivery, failure to progress, malpresentation, or alarming fetal heart rate tracings.[1] The most recent American College of Obstetricians and Gynecologists (ACOG) committee opinion on optimizing postpartum care published in 2016 cited pain as a considerable challenge for postpartum women, yet no current standard exists for optimizing post-Cesarean pain management.[2]

Although ACOG recommends a postpartum clinic visit, 60% of patients are estimated to be lost to follow-up; yet, approximately 40% of mothers are reported to have persistent pain at 3 months.[2,3] Furthermore, estimates suggest that 10–20% of parturients have persistent post-Cesarean pain up to a year following delivery that can be severe enough to interfere with their quality of life on a near-daily basis.[2–4] With such high rates of acute transitioning to chronic pain in conjunction with poor postdelivery follow-up, a tremendous gap remains between patient suffering and health care outreach and delivery.

ACOG recognizes that the postpartum period is stressful and many women suffer from fatigue, depression, and urinary incontinence in addition to battling preexisting health issues or difficult home social situations in the midst of caring for a new infant.[2] These stressors, compounded with a desire to limit systemic medications for breastfeeding, are possible reasons why women may leave their postpartum pain untreated. What remains for discussion is how we as regional anesthesiologists can intervene to address and treat the problem of acute post-Cesarean pain to optimize patients' quality of life during an incredibly challenging time and possibly prevent the transition to chronic pain extending beyond 3 months. Although techniques such as morphine via epidural and intrathecal (IT) routes have traditionally been used, the undesired side-effect profile has created an opportunity for truncal blocks to gain momentum.

"We must continue to strive for opioid-minimizing techniques in post-Cesarean section patients."

INTRATHECAL MORPHINE

Although IT and epidural morphine remain the most popular form of acute pain control for Cesarean pain, more than 70% of patients require additional analgesia.[1,5] Furthermore, the side-effect profile should not be underestimated; as many as 87% of patients experience pruritus and up to 70% experience urinary retention. Nausea and vomiting have also been well-established side effects, leading to significant discomfort for a new mother trying to provide acute infant care.[6] Although nonsteroidal anti-inflammatory drugs and acetaminophen are helpful opioid-sparing multimodal adjuncts, the role of regional anesthesia in improving Cesarean pain requires additional exploration.

TRANSVERSUS ABDOMINIS PLANE BLOCK

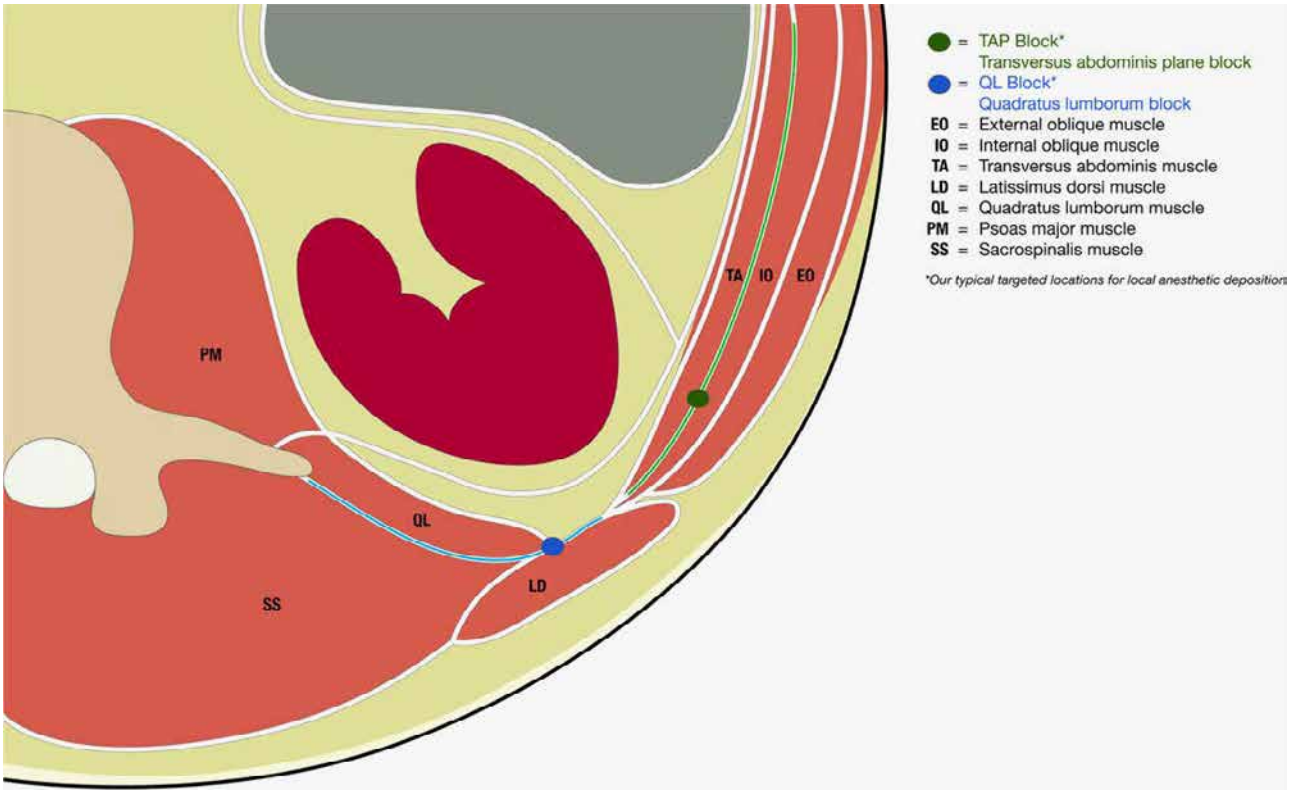
The transversus abdominis plane (TAP) block targets the anterior rami of spinal nerves, which include the intercostal, subcostal, iliohypogastric, and ilioinguinal nerves that travel between the internal oblique (IO) and the transversus abdominis (TA) muscles (Figure 1). It provides a sensory and motor block from approximately T10–L1 (Figure 2).[7,8] Several approaches have been described, including the lateral and posterior approach, which entails deposition of local anesthetic between the IO and TA muscles at the midaxillary line or triangle of petit, respectively.[7]

Randomized controlled trials and meta-analysis literature have reported controversial outcomes with the traditional lateral TAP technique, demonstrating no difference in total morphine consumption at 48 hours when compared with wound infiltration of local anesthetic for post-Cesarean pain.[7,9] When compared to IT morphine, patients receiving a TAP block experienced higher pain scores on movement, higher total 24-hour morphine consumption, and less time to first rescue analgesic, although opioid-related side effects such as nausea, vomiting, pruritus, and sedation were all higher in the IT morphine group.[10] The results have been corroborated by multiple other studies.[11–13]

QUADRATUS LUMBORUM BLOCK

The definition of the quadratus lumborum block (QLB) requires a nomenclature discussion. It was first described by Blanco[14]

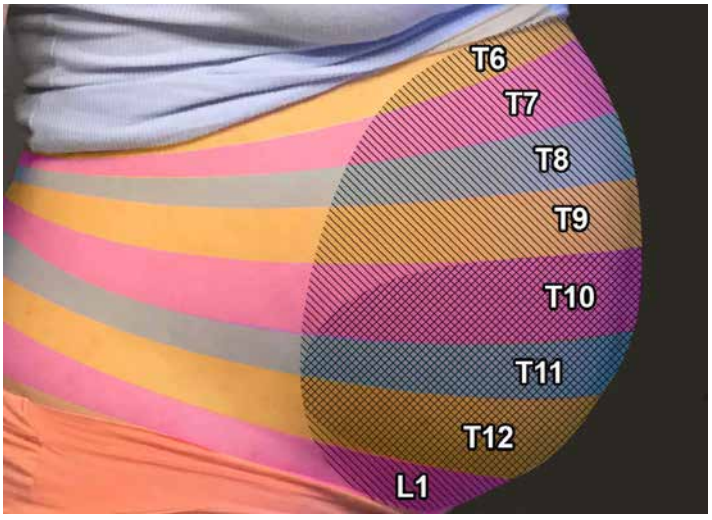
Figure 1: *Targets of the transversus abdominis plane and quadratus lumborum blocks.*



and originally published as the "posterior TAP block" technique. With the evolution of nomenclature, the current description of the QLB1 should be considered deep to the TA aponeurosis while the posterior TAP block is superficial.[15] Additional ultrasound-guided approaches, including the QL2 and QL3 block, have been described in the November 2015 issue of *ASRA News*.[16] The QL2 block, or injection between the posterior border of the QL muscle and the erector spinae, dissects the plane toward the midline and blocks the ilioinguinal, iliohypogastric, and subcostal nerve fibers. In addition, blocking the sympathetic nerve fibers that cover the thoracolumbar fascia sublayer has theoretical benefit. Future investigation is required for further conclusions regarding the optimal approach.

The QLB is a novel and promising technique and is currently used at both authoring institutions. However, opportunities for future investigation exist because few randomized controlled trials have examined the QLB in this patient population. What has been shown is that patients who received a QLB, compared to placebo, and undergoing elective Cesarean section were able to reduce their total morphine consumption by more than 40% within the first 12 hours, and overall fewer patient-controlled analgesic demands were required throughout the 48 hours post delivery.[6] When comparing the QLB to the TAP block in a similar patient population, the QLB outperformed the TAP block by significantly reducing morphine consumption at 12 (37.5%), 24 (55%), and 48 (48%) hours post delivery.[17]

Figure 2: *The transversus abdominis plane block provides a sensory and motor block from approximately T10–L1.*



"In the past few years, discussion and use of truncal blocks for Cesarean delivery has gained popularity. This is based on witnessed suboptimal pain relief that women endure after the procedures. Given that approximately one-third of all births are via Caesarean delivery every year in the United States, this issue poses a significant public health problem that we must not ignore.

With the use of ultrasound, we have improved our anatomical knowledge of the abdominal wall and have been able to understand that newly nominated fascial blocks can provide significant improvement in acute pain management. The blocks are starting to prove themselves as long lasting options for pain relief and are an important addendum to the multimodal approach we practice on daily basis. They should be given consideration as the gold standard of pain management.

In this issue, the authors recapitulate about different approaches and what clinical data has been published to date. There is no point in sailing deep into the waters of different mechanisms of action. The blocks are clinically proven as effective, simple, and safe with a clear effect on the speed of recovery, including earlier ambulation and decreased length of hospital stay.

We must maximize women's postoperative pain relief while minimizing side effects of our interventions. No matter whether you consider yourself a regionalist or a generalist, learning these techniques will be worth it."

—Rafael Blanco

CONCLUSIONS

Results of the QLB for post-Cesarean pain are promising and preliminarily appear to show that QLB outperforms the TAP block while avoiding any known additional risk. While the QLB gains momentum, what is yet to be determined is the ideal approach, the feasibility of service, and the effect on more long-term pain outcomes and quality-of-life markers for obstetric patients. Furthermore, combinations of IT or epidural morphine and QLBs remain a future area of study.

Regional anesthesia experts have much to contribute to obstetric anesthesia, and we must continue to strive for opioid-minimizing techniques in post-Cesarean section patients. We owe it to this group of generally healthy, youthful, and opioid-naive patients to optimize their postdelivery experience as they transition into a new role in life.

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Green Anesthesia Special Interest Group: An Innovative Initiative

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"One touch of nature makes the whole world kin." Ulysses expresses this in Shakespeare's *Troilus and Cressida* to indicate that through a shared feeling or goal, we all become siblings (in a sense of belonging). In contemporary medical practice, our consideration for nature and the environment is similarly necessary to make us feel like we belong to society.

The practice of medicine was borne out of compassion toward those who are suffering and the constant desire to explore, explain, and address various maladies. Pain and suffering had been a part of humanity's story until the discovery of analgesic and anesthetic agents. The development of the specialty of regional anesthesia and acute pain medicine is a true testament to the human effort to address the pain and suffering of humanity, leading to unprecedented improvements in medical and surgical care. For the first time, previously lethal maladies or afflictions could be easily cured. Although advancements in medicine have basic tenets in extending compassion to those in need, sadly, the greater good to the society and the social responsibility of health care in terms of environmental impact have been underrecognized.

The World Health Organization (WHO) constitution identifies the enjoyment of the highest attainable standard of health as one of the "fundamental rights of every human being without distinction,"[1] and our role as physicians is to provide access to health-enabling conditions. Unfortunately, the uphill task for us in the health care field, as WHO duly acknowledged, is that climate change is the greatest threat to global health in the 21st century[2] and that the provision of health care is one of the biggest contributors to the problem. Recent studies have estimated that health care is responsible for approximately 4–10% of the total United States greenhouse gas (GHG) emissions and has increased 30% during the past decade.[3]

It is the opinion of this special interest group (SIG) that anesthesiologists should be on the correct side of this debate and take measures to decrease the environmental impact of our practice, hence reducing our indirect burden on health care. The SIG plans to lead by example and to promote environmentally friendly practices in anesthesia through education and generation of evidence. The SIG's focus will be sufficiently broad so as to encompass the full spectrum of "green anesthesia" and will not be limited only to the environmental impact of regional anesthesia. Through the creation of this SIG, we intend to encourage research, publication, and education across the following fields.

GENERAL ANESTHESIA AND THE ENVIRONMENT

A recent study of operating room (OR) practices in three health systems by MacNeill et al[4] demonstrated how we can minimize our GHG impact by simply changing to a volatile anesthetic with a lesser carbon footprint. All inhaled anesthetics are potent GHGs of varying degrees, and some, like nitrous oxide and isoflurane, also destroy the ozone layer. Fortunately, the greenhouse impact of volatile anesthetics varies greatly, with the least GHG effect coming from sevoflurane and isoflurane and the maximal effect from desflurane and nitrous oxide. Hence the adage "short-term gain for long-term pain" aptly fits when one chooses to use desflurane or nitrous oxide because they have higher carbon dioxide (CO_2) burdens and longer half-lives (Figure 1).

"The provision of health care is one of the biggest contributors to global climate change. Regional anesthesia can play a leading role in the provision of 'Green Anesthesia.'"

Figure 1: *CO_2 equivalency per hour of the three commonly used volatile anesthetics at 1 MAC concentration and 0.5 L/min fresh gas flow. Calculations are based on the International Government Panel on Climate Change's Fifth Assessment Report. MAC (minimal alveolar concentration).*

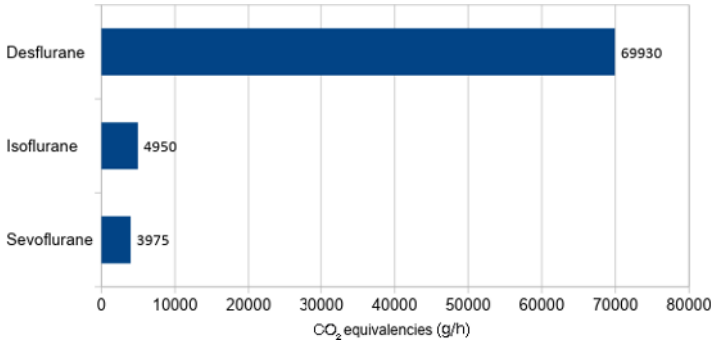
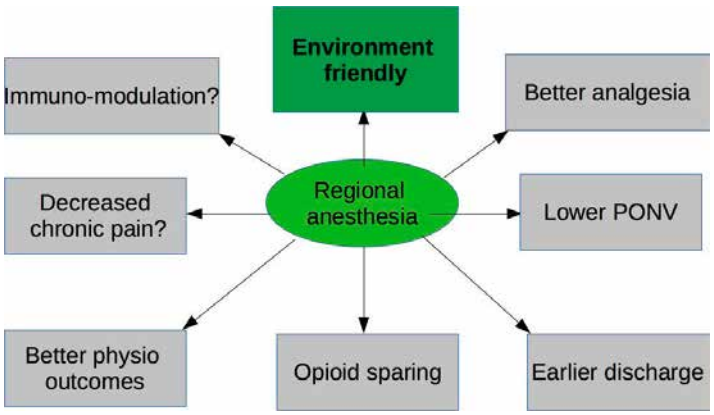


Figure 2: *Various advantages of regional anesthesia, including lower environmental burden.*



Because inhalational anesthetics do not fall under mandatory lists of agents reported by the pollution-monitoring agencies and are also the only agents left out of the Montreal Protocols list of halogenated fluorocarbons to be phased out by 2030, market research expects an increase in the consumption of inhalational anesthetics in the range of 10–15% per year. Our own practice habits, including the choice of inhalational anesthetic and the fresh gas flows we run, largely determine what impact our anesthetics make on the environment.

General anesthesia via intravenous agents is undoubtedly far better for the atmosphere, but it comes with its own set of problems. Our pharmaceuticals will reach soil and water either through excretion of the unchanged product or its metabolites or as waste occurring in the OR. We need to further our understanding of the life cycle of our medications and how they impact our ecology and population health. With all this in mind, one of the SIG's goals is to bring components of environmental sustainability into the practice of all anesthesiologists through educational initiatives. Some of the SIG's educational objectives are to advocate for improved and financially beneficial technology. Xenon, for example, has no known environmental impact and should likely receive additional attention and research.

Various metrics exist or are being developed to assist in our understanding of GHGs' impact on the atmosphere and their role in climate change. However, our understanding remains far from complete. Global warming potential—or the more appropriately termed *relative cumulative forcing index*—is an index of the total energy added to the climate system by our inhalation anesthetics relative to that added by CO_2, which was most recently updated in the fifth Assessment Report by the Intergovernmental Panel on Climate Change. Furthering all our understanding of the metrics, as well as their values and shortcomings, is an important SIG goal to advance research and communication in this area.

REGIONAL ANESTHESIA AND THE ENVIRONMENT

Regional anesthesia is an elegant modality to reduce or to avoid general anesthesia and can potentially play a leading role in green anesthesia. It has repeatedly proven benefits, including improved pain control and functional outcomes. Potential reductions in cancer recurrence or chronic pain require more compelling evidence (Figure 2) before they can be widely accepted as fact. Logic suggests that regional anesthesia is currently the anesthetic with the lowest environmental burden. Hence this presents us with a great opportunity to generate evidence and determine the favorable environmental impact of regional anesthesia either as a sole anesthetic or in combination with general anesthesia. One of the SIG's main goals is to launch projects exploring the environmental impact of various anesthetic techniques including regional anesthesia.

WASTE IN THE OR

Planetary resources are finite, and it is important to be responsible in their use. Media marketing increasingly promotes disposable OR equipment. However, the environmental impact of such an approach is not entirely clear. It will be important to generate independent life-cycle analyses for various equipment and to determine where reusable options might be more environmentally responsible.

Medication waste is another major issue that causes not only the aforementioned problems with soil and groundwater pollution, but also financial losses in the range of hundreds of millions of dollars per year. The downstream effects of such waste require significant research, which is in its infancy.

These examples are mere starting points for the field of green anesthesia. Progress will likely include rethinking tendencies and practices that have become prevalent in anesthesia in particular and

medicine in general. Yet it is up to us to generate interest and help address the problems of climate change and environmental destruction.

HISTORY AND STRUCTURE OF THE SIG

The Green Anesthesia SIG was approved at the ASRA board meeting in September 2017. We have 13 founding ASRA members and have appointed the following positions at inception:

Chair	Timur Özelsel
Co-chair	Ban Tsui
CME Liaison	Edward Mariano
Newsletter Liaison	Vivian Ip
Webcast Liaison	Jean-Louis Horn
Website Liaison	Rakesh Sondekoppam

The SIG's goals are as follows:

- To promote international collaboration for the development and advancement of environmentally sustainable practices in anesthesia
- To encourage research projects exploring the environmental benefits of regional anesthesia
- To promote implementation of regional anesthesia techniques by anesthesiologists with the goal of minimizing environmental burden from our practice
- To promote education in environmental sustainability in anesthetic practice.

The field of green anesthesia offers ample opportunities for research and education, and we look forward to welcoming more members to our SIG. Membership is free for all ASRA members; join by registering on the ASRA website or by contacting membership services. We urge as many members as possible to get involved in the SIG. We look forward to welcoming you to our SIG and working toward changing practices that will enable a sustainable and bright future for all life. Anesthesiologists and physicians in general should consider making the Hippocratic injunction of "first do no harm" applicable not just to their patients but to all society. Establishing this SIG is a vital step in that direction.

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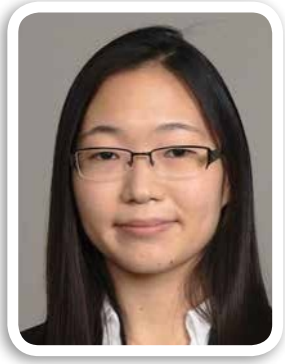
The High Road to Chronic Pain Management With Medical Marijuana



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Marijuana (*Cannabis sativa*) has been used for medical purposes throughout recorded history.[1] The plant was prescribed historically for myriad purposes, including appetite stimulation, treating epilepsy, managing grief, and assuaging labor pain, headaches, and sore muscles.[2] The *Cannabis* genus of flowering plants has also provided nutrition from its seeds and fiber for rope, paper, and textiles from its stem.[1] In the United States, however, the Marihuana Tax Act of 1937 imposed a registration tax and strict regulations on cannabis distribution that effectively dissuaded its prescription.[3] Subsequently, the Controlled Substances Act of 1970 classified cannabis as a schedule I drug with no accepted medicinal value.[4]

Despite cannabis prohibition in the United States and many countries worldwide, it has been widely produced and used unabated. In the scientific community, however, designation as a schedule I drug greatly limits cannabis research. In fact, the few investigators authorized to conduct clinical research with cannabis are limited to one strain from the University of Mississippi.[1] As an illegal drug with harsh federal restrictions, the taboos about marijuana continue.

"We have much to learn about the benefits and side effects of medical cannabis and our ability to regulate its safe usage, but we have a body of knowledge from which to start."

Recently, though, insight into the endocannabinoid system (ECS) and rising public awareness have renewed interest in exploring therapeutic and social potentials for cannabinoids. Beginning in 2009, the Department of Justice decided against enforcement of the federal laws, and most states in the United States have legalized either medical or recreational use.[5,6] Congress has since continued to uphold the Rohrabacher-Farr amendment, which prohibits the Justice Department from spending funds to interfere with the implementation of state medical cannabis laws. Despite this, stigma against cannabis is still widely prevalent, including within the medical community.

How can we create a paradigm shift about medical cannabis? Perhaps we can restructure our decisions by reexamining our knowledge base. In the age of the opioid epidemic, the need for redefining chronic pain treatments is ever present, and medical cannabis is a promising group of agents for chronic pain patients. We have much to learn about the benefits and side effects of medical cannabis and our ability to regulate its safe usage, but we have a body of knowledge from which to start.

Medical cannabis is an overarching term that describes all serviceable cannabinoids and a vast assortment of cannabis products that are consumed as smoke, vapors, oil, or capsules. *Botanical cannabis* and *medical cannabis* are notably overlapping terms, because botanical cannabis use is frequently reported for medical purposes. Cannabinoids are a chemical class of neuromodulators that function in the ECS, which participates in "relax, eat, sleep, forget, and protect" and may also play a role in ameliorating refractory nausea, muscle spasticity, seizures, pain, and inflammation.[7]

Cannabinoids are recognized in 3 groups: endocannabinoids (naturally synthesized by our bodies from membrane-bound lipid precursors), phytocannabinoids (derived from the *Cannabis sativa* plant species, that is, botanical), and synthetic cannabinoids (designed in the laboratory to mimic the effects of endo- or phytocannabinoids).[2]

Phytocannabinoids represent more than 100 lipid molecules found in botanical cannabis and are a subset of more than 400 natural compounds found in the *Cannabis sativa* plant, including potentially bioactive terpenes and flavonoids. Two major active phytocannabinoids of interest are δ-9-tetrahydrocannabinol

(THC) and cannabidiol (CBD), through which medical cannabis participates in the ECS.[4]

THC acts on 2 well-defined G-protein–coupled receptors: CB1 and CB2. CB1 receptors are most common in the central nervous system but also found in peripheral tissues; CB2 is a central and peripheral neuronal and nonneuronal receptor that modulates inflammatory and neuropathic pain.[4,7] Therefore, medical cannabis modulates pain at supraspinal, spinal, and peripheral levels, by modifying pain transmission and inflammatory responses. Interestingly, CB1 receptors are infrequently found in brain stem respiratory centers, explaining a low risk of respiratory depression from marijuana use.[4]

CBD, while producing some pharmacological effects similar to THC, such as attenuating inflammation, does not work primarily through CB1 or CB2 receptors. Instead, its anti-inflammatory, anxiolytic, and antiseizure effects are likely mediated through one or several other mechanisms, such as interactions with serotonin, adenosine, glycine, or transient receptor potential channel receptors.

As mentioned, cannabis use has a low risk of respiratory depression, and no lethal cannabis overdose has been reported in humans to date.[1,4] Cannabis use, however, does not come without consequence. THC is a psychoactive analgesic that can have short-term side effects on learning, memory, and attention, and it can cause euphoria; long-term side effects are not yet established.[8,9] Cannabis use before driving increases the risk of having a motor vehicle accident. In addition, prescription of medical cannabis to adults inadvertently exposes children to the risks from the compound. Cannabis legalization may even decrease the perception of its risks to adolescents, who have developing brains and are at greatest risk for experimenting with substances of abuse.[8]

In a nationwide study in the United States, 10% of all adult cannabis users reported taking the drug exclusively for medical purposes, and 36% reported a mixture of recreational and medical purposes.[8] Accordingly, understand that the levels of individual chemical constituents in most botanical cannabis products—and consequently in medical cannabis products—are currently greatly variable and unregulated.

Chronic pain conditions are common, debilitating, and notoriously difficult to treat using opioids, nonsteroidal anti-inflammatory agents, anticonvulsants, antidepressants, local anesthetic or steroid injections, and nonpharmacologic methods.[10] Medical cannabis can act as an adjuvant agent for refractory pain, with meaningful improvement in pain reported for 1 of every 3.5 to 9 patients with chronic, noncancer pain.[4,9,10]

In 2017, the National Academies of Sciences, Engineering, and Medicine (NASEM) released a comprehensive review of studies titled *Health Effects of Cannabis and Cannabinoids*. The NASEM committee found that chronic pain patients treated with medical cannabis can experience a significant reduction in pain symptoms, short-term use of synthetic oral cannabinoids improves multiple sclerosis-related muscle spasms, and synthetic oral cannabinoids can prevent and improve chemotherapy-induced nausea and vomiting.[8]

Patients with a variety of different diseases may someday benefit from medical cannabis. The hundreds of natural components in botanical cannabis should be studied, and novel, therapeutic, cannabinoid-derived agents may be discovered. Many of our present-day pain medications were actually derived from the plant world, including opioids, salicylates, and capsaicin. Unfortunately, cannabis's unyielding federal status as a schedule I drug continues to limit effective research.

In 1994, California was the first state to legalize medicinal cannabis use. Since the Rohrabacher-Farr amendment, medical cannabis is now legalized in 29 states and Washington, DC. Our state of Pennsylvania passed its legislation in April 2016 and continues to solidify the rules and regulations. Pennsylvania's law has taken a highly medicalized approach, requiring staffing of dispensaries by physicians and pharmacists and the incorporation of funded research collaborations between select medical cannabis entities and the state's medical and research institutions. In addition, clinicians involved in recommending and dispensing cannabis will be required to complete at least 4 hours of continuing medical education. Current indications for medical cannabis prescription in Pennsylvania are 17 serious medical conditions, including pain listed on its own, as well as amyotrophic lateral sclerosis, cancer, Crohn disease, spinal cord injury, HIV/AIDS, inflammatory bowel disease, multiple sclerosis, neuropathy, and sickle cell anemia.

As we await cannabis reclassification at a federal level, pain physicians should leverage what we do know about cannabis to benefit our patients with chronic pain. Only half of chronic pain patients describe their pain as “under control.”[4] Until blinded, randomized studies are conducted, pain physicians can prescribe medical cannabis to patients whose pain is refractory to conventional medical therapies. Institution of multimodal pain regimens can be used to minimize medical cannabis dosages and its potential side effects. Certainly, all patients should have the opportunity to ease their unrelenting and debilitating conditions.

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Pain Management and Palliative Care in Sub-Saharan Africa: Reflections From Uganda

Pain management is a subspecialty still in development in much of sub-Saharan Africa. Access to providers and medications is severely constrained over much of the region. Cultural factors, such as mistrust both of providers and concerns regarding opioid use, also act as barriers to care. Although some academic anesthesia training programs exist,[1] the majority of palliative and anesthesia care in Uganda is provided by individuals who have limited formal medical or nursing training.[2] Regional anesthesia is largely unknown,[3] and access to pain medications is severely constrained. As a result, pain management training has been limited to the palliative care setting.

Palliative care was introduced in Uganda in 1993 by Dr Anne Merriman, founder of Hospice Africa Uganda (HAU) in Kampala. HAU is a nongovernmental organization that provides support and care to those dying from cancer and HIV/AIDS. Over the past few decades, services have expanded to include affiliated clinics in two other districts as well as training programs and collaborations throughout much of the country. Palliative care is cited as an essential health service in the Ugandan National Health Plan and prioritized by the government in multiple reports,[4] but financial constraints mean that funding for palliative care is still highly dependent on extramural donors.[5]

According to statistics HAU compiled in 2016, an estimated 57% of Ugandans do not have access to health care[6] and some 250,000 are in need of palliative care to improve their quality of life. Legislative efforts to broaden morphine-prescribing abilities to palliative care nurses and clinical officers have increased the availability of symptom relief in rural communities.[4] However, drug supplies are frequently limited.[7] In a survey of government-funded HIV care facilities in Kenya and Uganda, morphine was only intermittently available in 7% of facilities, whereas nonopioid adjuvant agents were available in 73% of facilities.[8] HAU opened a morphine sulfate–processing production in an attempt to address the limited opioid availability and is now the only manufacturer of morphine in the country.[9] Studies of selected patients in Kenya and Uganda suggest that patients diagnosed with cancer in this region experience a high burden of symptoms (a mean of 18 reported physical and psychological symptoms over the course of 7 days), with pain as the predominant complaint.[10]

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Figure 1: *Examination room.*

Figure 2: *Hospice complex.*

An estimated 46% of patients admitted to hospitals in Uganda had a life-limiting disease (vs estimates of 5–23% in comparable European studies). When interviewed, patients expressed concerns across multiple dimensions, including inability to afford medical care (50%) and limited access to food (14%), in addition to often-inadequate symptom relief.[11]

HAU is the main referral site for all outpatient palliative care in the Kampala area and accommodates roughly 800 new patients per year. In total, 58% of the patients who present to HAU have cancer, most commonly cervical cancer (38%), followed by cancers of the breast (18%), esophagus (16%), or prostate (13%). Among HAU's patients, 9% present with comorbid HIV and cancer, and 21% follow up for other symptoms and issues related to HIV.[12] Only 12% of patients at HAU have a primary diagnosis that is not cancer or HIV. This subgroup includes patients with autoimmune disease as well as chronic pain; both conditions have limited treatment pathways. Patients frequently present with advanced malignancy and are subsequently referred for hospice management. For example, one patient sought care after her right breast had autoamputated from necrotizing cancer. Other patients present with HIV-associated neuropathy or with a debilitating lower-extremity pain syndrome associated with AIDS.[13]

"An estimated 57% of Ugandans do not have access to health care and some 250,000 are in need of palliative care to improve their quality of life."

Patients treated at HAU receive multimodal analgesia in the form of morphine and nonopioid adjuvants, as well as wound care and medical supplies in exchange for a small donation. Roughly one-

Figure 3: *Morphine supply under lock and key at a community hospital near Mbarara.*

Figure 4: *Stock of donated antiretrovirals at a community hospital.*

third of patients who are seen at HAU can afford to pay the fee (less than $3 USD), whereas the remainder receive charity care. Clinic hours are held daily and complemented by a home visit and outreach programs. HAU also trains community volunteers and offers palliative care courses for health care workers in other African countries.

In June 2017, I travelled to Kampala, Uganda, to work with HAU as part of my palliative medicine fellowship. I traveled with the hospice staff and saw patients in multiple care settings (Figures 1 and 2). Many of our patients were locals, others had travelled to Kampala for cancer evaluations not available in their home districts, and some were refugees. I took care of a 7-year-old child presenting with AIDS and severe abdominal pain because of bulky lymphadenopathy, a 10-year-old child with a hepatic mass and massive ascites, a woman who sustained extensive third-degree burns to her face and chest wall after seizing and falling into a cookfire, and another young woman who had just undergone hip disarticulation for hemangiopericytoma. All of these patients received pharmacologic pain management in addition to psychosocial counseling. HAU also offered a small stipend for additional care costs for families that were financially struggling.

Although the resources and pharmacy supplies at HAU may be small (Figures 3 and 4), the institution offers a distinct vision of multimodal symptom management. In spite of limited resources and training, the staff takes a comprehensive approach to patient care, which has had a substantive impact on the lives of over 28,000 patients to date.

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