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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President's Message

ASRA Is a Strong Organization That Continues to Flourish

Once upon a time, a ship set sail from the Old World carrying as many people as she would hold and as much gold as she could contain. Initially the seas were smooth and the sailing easy, but during the journey, the seas became rough. If the ship was going to make it to the New World, it had to reduce its weight. The captain had to make a decision whether to throw the people or the gold overboard.

For ASRA, the seas are quite calm, but we do have an expanding membership, larger meetings, and growing resources. We aren't going to be throwing our gold overboard, but this is the time for ASRA to invest in our longer-term future by investing in our members.

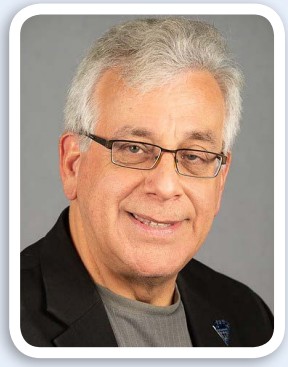
I am honored, thrilled, and overwhelmingly humbled to be your new president, which I feel is the highlight of my career. Be assured that I am here to support you, the members of ASRA, and to advance the Society. I am thankful for those who have led the Society to its current state of success and stability, and I am particularly grateful to all of you who volunteer your time and energy to advance the Society. I will always remember that we are a volunteer organization.

"We have never been stronger, more stable, or larger in our history, and I am privileged to take the reins at this golden time."

We have never been stronger, more stable, or larger in our history, and I am privileged to take the reins at this golden time. Our meetings are more successful than ever, membership has grown markedly, and, as a self-managed organization, we have the financial stability to plan for the future.

High on my list of priorities is to make ASRA a more diverse organization. Diversity can take many forms, one of which is broader representation from many institutions and sectors. Over the course of the next 2 years, we will visibly move to ensure more women are represented on our annual meeting panels. We've formed a special interest group (SIG) to support the advancement of women in regional anesthesia and acute and chronic pain management to provide peer support and mentorship. This coming year will be designated to acknowledge the contributions of women to the Society and our specialties. We encourage anyone to approach the leadership with their ideas without feeling marginalized.

The field of anesthesiology and pain medicine is evolving. I frequently tell my residents that I started my career in the operating room (OR), and if I had chosen, I could have spent my entire career there. But the stability and advancement of the specialty will likely take the next generations far from the OR into perioperative medicine and into hospital leadership positions. We are a leading force of ERAS (enhanced recovery after surgery) because outcomes are intimately linked to anesthetic choice and pain management. As pain physicians and diagnosticians, we can lead the field in discouraging the notion that our interests are just procedures.



Eugene R. Viscusi, MD
ASRA President

Physician burnout and suicide are increasing worrisome indicators that recent changes in medicine are leading to physicians' feeling a lack of power and autonomy. To raise awareness and offer solutions and support, physician wellness will be a constant theme at our meetings. In the past 10 years, physician-owned practices have dropped from about 80% to now less than 30%. The usual reasons cited are increasing regulatory and administrative burdens, decreasing reimbursements, and challenges in practice management. ASRA will continue to invest in a portfolio of offerings for both pain physicians and hospital-based physicians to help them better understand how to manage their practices, should they choose to pursue private practice, and, if employed under an institution, to understand how best to manage their practices to effectively negotiate payment and maintain autonomy.

We are leaders in ultrasound application in regional anesthesia, acute and chronic pain, and, now, point-of-care ultrasonography. Expect to see expanded offerings for our members in these emerging and needed skills.

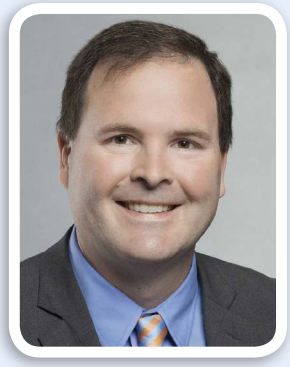
Our annual meetings remain the lifeblood of the Society, and so we look carefully at what engages attendees. Traditional lecture formats are giving way to shorter presentations, more interactive sessions, and hands-on experiences. We repeatedly hear that our meetings give an ASRA "family feel" in a friendly environment that allows for casual interaction with faculty and other participants. Regardless of how much our meetings grow, they will never lose that intimate, interpersonal connection.

One of the key ways ASRA can support its members is through quality research that provides evidence of the value of what we can do for our patients and produces guidelines for practice. The Society will continue to expand these areas in the coming years.

Lastly, one of the most common questions I am asked is how I became involved in ASRA and advanced in the Society. With a bit of humor, I quote Woody Allen, who once said, “80% of life is showing up!” The key is to be present and persistent. For me, it took a number of years before I found opportunities for advancement. Consider joining a SIG or two, where you can exchange ideas with like-minded members and volunteer when possible. Volunteer for an ASRA committee once you are getting known in the Society. Apply to associate faculty when you feel ready. Not everyone can or will participate in the same manner, but we have many ways to grow professionally and help the specialty and the Society advance. Along the way, you will make lifelong friends and enjoy a national or global conviviality with peers striving for the same goals. For me, this has been the greatest benefit and joy of my long ASRA relationship. Ultimately, we are here to support each other, improve the care of our patients, mentor our young, and advance our chosen specialty for those who follow behind us.

As I begin this journey for the next 2 years, I ask for your support, your advice, your hopes and dreams for ASRA, your prayers, and, most of all, your patience. I am here to serve you and the Society.

Feel the Burn



Kristopher M. Schroeder, MD
Associate Professor
University of Wisconsin School of Medicine and Public Health
Madison, Wisconsin

As physicians, anesthesiologists, and pain management providers, we have a high risk for job-related burnout. I have experienced firsthand the dissatisfaction associated with arriving to work early to provide a preoperative assessment, manage multiple patients' preoperative medications and testing requirements, patiently wait for the nursing assessment, start an intravenous line, and finally be interrupted by the surgeon, resident, medical student, research team, etc, before being berated by the surgeon for a 3-minute operating room (OR) delay.

Other sources of job-related stress might include surgeons preferring not to wait for regional anesthesia procedures out of concern for OR delays or feeling pressured by colleagues to provide regional anesthesia for patients with significant relative or absolute contraindications.

Often, stressors are accompanied by an administration that does not understand your workflow or appreciate your absolute commitment to patients. Amid those demands is the need to maintain skills relevant to providing general anesthesia for a wide variety of surgical procedures. At times, it is difficult to not just admit defeat, walk the easy path, and throw in a laryngeal mask airway.

To survive and flourish in such an environment, pain physicians must establish strategies to build camaraderie and decompress following those busy mornings. Although I certainly do not assume that I am an expert in these matters, our group has adopted daily wind-down sessions that slow the hectic pace of getting all of the first-start OR cases launched. Those sessions include mindfulness exercises and colleague recognition and affirmation. In addition, we plot the remainder of the day, develop staffing strategies to effectively manage scheduled cases, attempt to predict and deal with add-ons, and tend to inpatients with neuraxial or perineural catheters and ketamine infusions. We also evaluate the subsequent day's schedule and allocate appropriate staff resources to minimize the stress associated with too much work for too few people. The sessions include our block nurses and chronic pain advanced practice providers, so we are able to simultaneously improve patient care through coordinated efforts at pain management.

In addition to daily group affirmation and revitalization sessions, using a strong network of professional colleagues to recount recent wins and losses can be vital to maintaining career satisfaction and preventing feelings of failure and despair. Your network might work with you at your own institution or you may only encounter them at ASRA's annual meetings; if the latter is your situation, consider sending intermittent text messages or calls to check in and ensure that all is well or recount tales of recent struggles. We live in such an era of Instagrammed success stories that it is easy to feel that you are the only one dealing with a certain scenario or complication. Understanding that others share your struggles can go a long way toward contentment.

"Using a strong network of professional colleagues to recount recent wins and losses can be vital to maintaining career satisfaction."

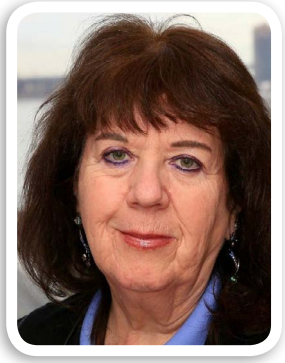
In an ongoing era of drug shortages and opioid-tolerant patients, our collective jobs will likely become progressively more difficult. Core to maintaining career satisfaction is reframing what might constitute a success in certain patient populations. We need to avoid focusing only on the negative aspects of our practice (eg, failed blocks, complications) and engineer mechanisms to highlight our positive impact. Finally, I challenge you to identify five people whom you can trust to honestly appraise a work-related situation that you might be dealing with and provide you with guidance and support. If you can't think of five, now is the time to reach out to your colleagues at ASRA and create a network of support.

Regional Anesthesiology and Acute Pain Medicine Fellowship Directors' Group Adopts Common Applications for Overwhelming Majority of US Programs

The Regional Anesthesiology and Acute Pain Medicine (RA/APM) Fellowship Directors' Group is a voluntary group that was founded in 2002. The group's original goal was to create guidelines for fellowships in the subspecialty. The first version of the guidelines was published in 2005 in *Regional Anesthesia and Pain Medicine*, and two subsequent reiterations to address advances in the subspecialty were published in the same journal in 2011 and 2015. The group submitted the application for fellowship accreditation to the Accreditation Council for Graduate Medical Education, an initiative led by Dr. Edward Mariano. Among other group achievements has been Dr Gregory Liguori's and Dr Joseph Neal's leadership in the creation of an electronic RA/APM fellow alumni directory, which has been used for several research and educational endeavors; and Dr Linda Le-Wendling's leadership of the continued update of a preknowledge and postknowledge test, a question bank focused primarily on regional anesthesiology and acute pain medicine topics.

"The group continues to work on endeavors to improve the experience for RA/APM fellows, including the application process, which can be difficult for candidates to navigate with more than 75 North American RA/APM fellowship programs available currently."

The group continues to work on endeavors to improve the experience for RA/APM fellows, including the application process, which can be difficult for candidates to navigate with more than 75 North American RA/APM fellowship programs available currently. At the spring 2018 group meeting during the ASRA World Congress, Dr Brian Allen proposed moving to a common application and presented a draft for review. At the fall 2018 group meeting in San Francisco, California, a large number of the US fellowship programs agreed to use the common application in recruiting for the 2020–2021 academic year. (Some programs are unable to use it because of alternate internal or external requirements.) As of January 2019, a total of 57 US programs are now using the common application (88%).



Mary J. Hargett, BS
Administrative Director, RA/APM Fellowship Directors' Group
Director – Education and Clinical Initiatives
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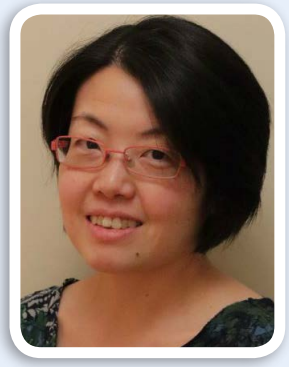
A list of US RA/APM fellowship programs that accept the common application, as well as the application itself, is on the ASRA website.

Interview With a Prominent Female Leader in Regional Anesthesia in Canada: Jennifer Szerb, MD, FRCPC

In the 21st century, society is becoming increasingly aware of the need for gender representation, equality, and diversity. Although the number of female physicians in leadership roles is increasing, more female leaders are still needed in the field of medicine. Recently, I had an opportunity to interview Jennifer Szerb, MD, FRCPC. Jennifer is a professor in anesthesia and pain medicine at Dalhousie University in Halifax, Canada. She was the chair of the Regional Anesthesia Section of the Canadian Anesthesia Society. She also founded and directed the regional anesthesia program in Halifax.

Jennifer Szerb, MD, FRCPC



Vivian Ip, MB, ChB
Clinical Associate Professor
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Since my abstract presentation of Doctors Against Tragedies (DAT) card games as an educational tool for the public and university students at the ASRA World Congress in April 2018, Jennifer has initiated her own DAT chapter in Halifax. There, she recruited a team of medical students to help advance this important health advocacy project. Jennifer demonstrates a passion for education and career advancement for the next generation of anesthesiologists. She is also actively involved in global health and teaches regional anesthesia in Rwanda, Bolivia, and Guyana.

"Let's not forget that women have achieved leadership positions precisely the same way as men: through sacrifice, being freed up from family responsibility, and ambition. It is a myth that as a female leader you can have it all."

Viv: You are recognized as a leader in regional anesthesia. What are your secrets of success?

Jennifer: There is no single amazing secret; it all comes down to hard work. When you are trying to build a regional program, start small, working with surgeons who are receptive to regional anesthesia techniques. You don't have to win over all of the surgeons and your colleagues at once. I gave a huge number of presentations and grand rounds on regional anesthesia as well as workshops designed to improve the skills of my non–regional anesthesia-trained colleagues. I was the only anesthesiologist with a regional fellowship at my hospital, so I worked on developing a strong cohesive group with the basic block tool box. They became the core regional group that eventually staffed an out-of-operating-room block room. With strategic recruitment, we now have a thriving team of fellowship-trained regionalists.

Networking is also an important aspect; when I was president of the Regional Anesthesia Section at the Canadian Anesthesia Society, I connected with some prominent figures in regional anesthesia across the country.

Viv: How do you define success?

Jennifer: With a regional anesthesia program, success is not just measured in terms of number of blocks or patients' clinical outcomes. The regional anesthesia program at Dalhousie includes academic activity with active research, fellowship experience, and teaching anesthesia residents. Furthermore, regional anesthesiologists are actively involved with the acute pain service and overall quality improvement when it comes to perioperative pain management.

Success comes when you can hand over leadership of a program to a dynamic young leader and to assume the role of mentor. It is very gratifying to know that the program will endure without me and to see it evolve to encompass all levels of academic achievement.

Viv: What are the qualities of being a good leader?

Jennifer: I am not so sure I can put myself in that category. I have tried to lead by example in my commitment to each patient, dedication to the learners' experience, support for my colleagues, and acknowledgement of the contributions of our incredibly hardworking block room staff. I would have to say that in my interactions with surgeons and administrators, I have had my share of conflicts, including people who have reported me for various rule infractions. So I would say you have to be like a bulldog with a bone between your teeth. Hold on to your goals with tenacity. Often,

achieving change in an institution is as hard as changing the course of the Titanic by 3 degrees.

Viv: What has been a defining moment for you in your academic career?

Jennifer: This is a tough question: There is no one defining moment. My research was boosted tremendously when our team received the 2015 ASRA Best of Meeting Award for our abstract, "Histological Confirmation of Needle Tip Position During Ultrasound-Guided Interscalene Block: A Randomized Comparison of Intraplexus and Periplexus Approach." Achieving the rank of full professor in 2016 was important not only for me personally, but also for increasing the female representation at that level.

Viv: How do you gain support from your department and colleagues and garner recognition?

Jennifer: First and foremost, clinical expertise and technical skills are respected. Research achievements and the ability to teach are less visible overall and therefore undervalued. It's all about how you can demonstrate the benefits to patients, support people to achieve success in their careers, and retain your sense of humor.

Viv: Do you think men and women are different in terms of the level of support and recognition they receive?

Jennifer: I have always worked in a very egalitarian department with a strong group of women at all stages of their careers. The extra challenge for both young men and women comes when attempting to attain promotion through the academic ranks. The criteria for achieving professor, no matter what academic stream, require a demonstration of regular research output. This is challenging without protected time, because evenings and weekends are devoted to raising children. The glass ceiling occurs because young anesthesiologists are busy with their families, whereas academic promotion requires an additional workload leading to imbalance and often necessitates a partner willing to be chief cook and bottle washer at home.

Viv: Have you had any strong mentors who helped you along your path to success?

Jennifer: My fellowship director, Dr Desirée Persaud, immediately comes to mind. She was an amazing teacher and someone I have always tried to emulate. I still report my progress to her, such as just passing the European Diploma in Regional Anesthesia exams in 2018.

Viv: What qualities made that mentor successful? Any advice on mentorship?

Jennifer: Mentorship is about being available to listen, offer advice, and support. Basically, it's about being a wise sounding board through the struggle to attain career advancement. Anesthesia departments should have a formal process where junior staff are paired with senior staff to help with career path planning. On a personal level, I had to seek advice externally from a career counselor, which was very valuable and I highly recommend.

Viv: Do we need more female leaders? Why do women struggle to get into leadership positions?

Jennifer: This is a loaded question. It implies that female leaders will behave differently than male leaders in terms of their style of leadership—for example, being more nurturing than their male counterparts. Let's not forget that women have achieved leadership positions precisely the same way as men: through sacrifice, being freed up from family responsibility, and ambition. It is a myth that as a female leader you can have it all. When I poll my junior female colleagues, they tell me that they still do at least the bulk of the mental activity, scheduling, and home and child care. Rather than beating our breasts and bemoaning the lack of female leaders, we should examine whether work sharing between partners really is happening in the home.

Additionally, to answer this extremely complex question, women choose to spend more time with their kids when they are little. I think we should actually value this and applaud their commitment to raising good, solid citizens.

Finally, I have to go back to my own story: I went back to start an anesthesia residency when I was 39, so my kids were mostly grown. Rather than working full-time, I had one unpaid day a week that allowed me to do administrative and research activity. I sacrificed my income and free time to get where I am. Leadership is not an entitlement; it is something earned.

Viv: What have been the hurdles in terms of getting recognized, especially as a woman in the predominantly male specialty? Any tips for defeating these hurdles when women want to advance in their career?

Jennifer: Recognition for women is no different than for men. It is about achievement. However, women have an extra hurdle to attain academic, research, clinical, and teaching deliverables, because they often do more than their fair share of childcare, and homemaking. I think that the concept of giving women a step up with more protected time would be a huge help in terms of putting them on a level playing field.

Viv: Do you think one can do the best in both worlds? Any advice for the young generation regarding this aspect.

Jennifer: Academic promotion and a balanced life are an oxymoron. Here is my advice for the younger generation: There is

a trajectory to any career—focus on your family and make sure you and your kids are okay. You have plenty of time to focus on academic deliverables and leadership roles when you turn 40. After 14 years of general practice, I did not start my anesthesia career until I was 44. And recognize your limits: Never be afraid to say no if a task is too overwhelming. I used to do a talk at the Canadian Anesthesia Society about top articles of the year in regional anesthesia and read almost every regional published paper for a year. It was a huge challenge, and I could not sustain this.

Viv: What are your thoughts about the #MeToo movement in the medical profession? Is it going to bring about a cultural change in medicine?

Jennifer: I am happy to say that as far as I know, sexual harassment does not occur in my work environment. Unfortunately, I cannot say that for bullying and disrespectful behavior. There is definitely a difference in the way male surgeons interact with junior female anesthesiologists that they would not dare try on senior male anesthesiologists. I think we should have open discussion and conflict training involving all staff. It is not enough to have a poster saying this is a respectful workplace. Hard work is not the cause of burnout and workplace stress. Harassment creates a toxic environment for all.

Viv: Should there be more in the way of wellness for women in medicine? How can there be more protection and support for women in the workplace and society?

Jennifer: Many young women and men with families in anesthesia do not work full-time so they can be with their families. This is not something that is given to them; it comes at the cost of income. Being a bit more generous with protected paid academic time may be a way to support them.

The media devotes much attention to topics such as physician burnout and wellness. I don't think we have enough emphasis on how lucky physicians in North America are. They have a steady income and are often self-employed with no supervisor to report to. They live in nice houses, take holidays, and send their kids to good schools. That's not always true for other parts of society, who may face job loss and little savings. So, if you are feeling self-pity, involve yourself in global health. I have been an active volunteer with the Canadian Anesthesiologists' Society International Education Foundation, and I am planning to go on my fifth trip to Rwanda for a month of teaching. When I come home, I am going to kiss my anesthesia machine and my wall oxygen. I am going to feel lucky taking a hot shower and going for a walk in the park. Let's start putting our lives in perspective.

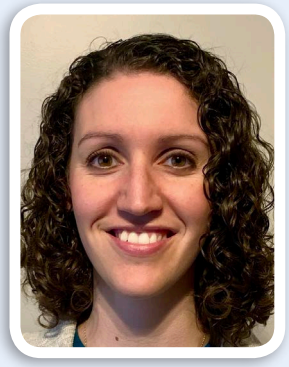
Viv: What do you think the best way is to foster diversity and inclusion in our subspecialty? Do you think ASRA is moving toward embracing diversity?

Jennifer: I think ASRA can congratulate itself on already being extremely diverse. I am amazed when I go to a meeting to see regionalists from all over the world.

Interview With a Regional Anesthesiologist in Private Practice in the United States: Maggie Holtz, MD

Maggie Holtz, MD

I had the pleasure and honor of interviewing Maggie Holtz, a private practice physician anesthesiologist for Georgia Anesthesiologists. In addition to being a phenomenal physician anesthesiologist and mother of two children, Maggie is the chief of regional and orthopedic anesthesia at WellStar Kennestone Regional Medical Center in Marietta, Georgia, a position she has held for the past 5 years. She has been instrumental in enhancing the role and prominence of regional anesthesia at her practice by expanding the size of the team, implementing enhanced recovery protocols, and introducing new and advanced regional techniques.



Lisa Klesius, MD
Assistant Professor
University of Wisconsin
Madison, Wisconsin

Maggie is also passionate about teaching. She has been involved in several national and international workshops to promote education and knowledge of new regional anesthesia techniques with the ultimate goal of improving postsurgical outcomes and patient satisfaction. Maggie's story is truly inspirational and shows how hard work, passion, and dedication to the field of anesthesiology can lead to a rewarding and successful career, no matter one's background or gender.

"At the end of the day, what matters in medicine is not what chromosomes one was born with, but rather one's competence, passion for the work, ability to work as a team, and empathy for patients."

Lisa: Can you describe the leadership roles that you have been in or are currently involved in? How did you attain those roles?

Maggie: I've worked for Georgia Anesthesiologists, PC, a private practice group in suburban Atlanta, for 7 years and have served as the chief of regional and orthopedic anesthesia at WellStar Kennestone Regional Medical Center for the past 5 years. I have to give a lot of credit to my amazing group for believing in me and never treating me like I was any less of a contributor simply because I was a woman, or—gasp—worked part-time. I spent a couple years on faculty: first at Emory, then at Yale, and when I took my job at Georgia Anesthesiologists, I had two kids under the age of 2. So I made the decision to put my career on hold and work part-time. My group was extremely male dominated, but once I—once anyone new—proved competence, gender became irrelevant.

After 2 years at my practice, I was offered the position to run the regional service, and I of course jumped at the opportunity. I am proud of what we have achieved: Our block service is a critical player in enhanced recovery protocols, and we have grown to where we now have 6 dedicated block bays, 10 anesthesiologists skilled in regional anesthesia, and 4 dedicated block nurses. We perform approximately 700 blocks per month, embrace the most progressive and advanced techniques, and are truly making a difference in the recovery of our surgical patients.

Lisa: What strategies helped you achieve success in becoming a leader in the field of regional anesthesia, particularly as a woman in a male-dominated field?

Maggie: I am true to myself. Always. And unapologetically. I have never understood female physicians who abandon their true selves in an effort to be "accepted" by the boys' club. Quite the contrary: I think there is so much power in being a woman. And at the end of the day, what matters in medicine is not what chromosomes one was born with, but rather one's competence, passion for the work, ability to work as a team, and empathy for patients. I believe self-righteousness and hierarchy should be checked at the operating room door, because they don't belong there. We all have the same goal and are on the same team.

In regional anesthesia specifically, I am forever grateful for the network of incredible regional anesthesiologists I have met at ASRA meetings and through consulting. Through a series of chance meetings, I have had the incredible opportunity to get involved in teaching at various national workshops and one international regional anesthesia workshop, including state anesthesiology society meetings as well as the New York School of Regional Anesthesia. I am honored to work side by side with some of the giants—both male and female—in our field, and even though I

am there to teach, I also continually pick up pearls just by being in the presence of those minds. I also speak throughout the country on opioid minimization, optimization of perioperative pain control, and migration to same-day total joint replacement. To me, it's of ultimate importance to never be satisfied but rather to always be hungry for more knowledge, more progress.

Lisa: What differences or challenges have you experienced becoming recognized as a female leader working in the private sector compared to those working in an academic institution?

Maggie: Having worked in an academic setting before I joined my practice, I can say that it just takes more self-directed learning. We don't have grand rounds, visiting professors, or contributors to research. The literature and the newly described techniques aren't in our faces every day. We feel the pressure of performance and efficiency rather than research and teaching. We don't have the infrastructure to support carrying out big studies, and because publishing is so critical to being recognized as a leader in this field, we are at a disadvantage if you look at it that way. But what we do have is numbers. Lots of them. And so we become very skilled very quickly. Our recognition as private practice regional anesthesiologists isn't ever going to be on the podium at national meetings or on the cover of *Regional Anesthesia and Pain Medicine,* and that's okay with me. Rather, my fulfillment comes from our patients who are able to go home a couple hours after having a total joint replacement because of the blocks we perform, the multimodal regimen we initiate, and the protocols we have in place, and also their family and friends who subsequently come for the same surgery and ask for us by name to take care of them.

Lisa: Did you encounter any obstacles on your path to success? Did you feel that you had to work harder than your male colleagues to attain success?

Maggie: I do feel like I had to up my game when I first joined my practice—to prove my worth, if you will. But once I demonstrated my competence and my commitment, I have never since felt like my gender has had much to do with anything in my group. Sure, I get tired of everyone else—patients, staff, etc—assuming I am a nurse simply because I am a woman or address the male PA student as "Dr" and me as "Ms," but that's an exhausting, consuming, and losing battle to fight. So I prefer to just move on. I know who I am.

I have had obstacles, of course: not necessarily because I am a woman, but because I am progressive. When the goal is something new, something that challenges the status quo, it's easier to stay the course. But we must develop a thick skin; not take failures, challengers, or challenges personally; and keep the end goal in mind. Very few things that are worthy are easy.

Lisa: Do you feel that the barriers for women in anesthesia to attain success have decreased or changed now that more women are entering the field?

Maggie: I feel grateful to have so many positive female role models in the field. I hope they continue to inspire female medical students to enter anesthesiology and female anesthesiologists to learn more about regional anesthesia.

This may be an unpopular and divergent sentiment, but I must say I hope we don't cause a greater gender divide by putting so much emphasis on "female" this and "male" that. Why must I have the qualifier as a female regional anesthesiologist? Why can't I simply be a regional anesthesiologist? I much prefer the latter.

Lisa: What challenges still exist for women entering the field of anesthesia to become successful leaders?

Maggie: I think a lot of it depends on the standing leadership at the individual institutions. A gender-blind leader will promote based on merit, not because of, or in spite of, a specific gender. On the other hand, if the standing leadership has an inherent bias, I do believe that women have to work harder to surpass their male colleagues.

Lisa: Did you have any mentors who helped you in your path to success? Do you think it is important for women starting out in their careers to seek out a mentor?

Maggie: I have had a number of amazing mentors along the way, both male and female. It has always been more important to me to find someone, regardless of gender, who shares common ground and similar goals.

Lisa: What advice can you give women who are just beginning their careers in anesthesia?

Maggie: Stay true to yourself. Be a team player. Go out of your way to be inclusive: Everyone on the surgical team, from the person who cleans the floor to the attending surgeon, is important. Always, always maintain a hunger for learning new things. Push the envelope in the name of progress. Fail. Try again. Find joy in your job: It's the best field in medicine.

Lisa: How do you maintain your work-life balance?

Maggie: Does anyone have the definitive answer to this?

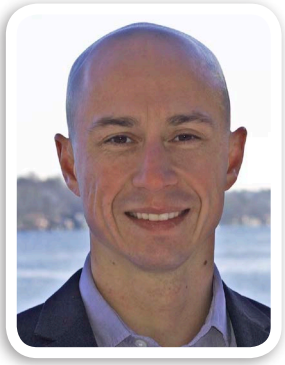
It's just that: a balance. A very wise female surgeon once told me, many years ago, "you can have it all. You just can't have it all at the same time." For me, it's about being present. When I'm at the hospital, I try my best to be present and fully focused on my patients and the work at hand. When I'm at home, I try to be

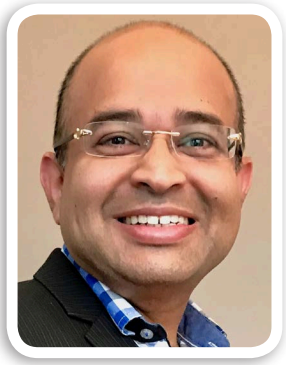
fully present with my kids and not take too much work home. Of course it's not always that perfectly compartmentalized, but it's my consistent goal.

Lisa: Is there anything you wish you had known when you were at the beginning of your career?

Maggie: I wish I hadn't looked so far ahead but rather appreciated where I was in the present. I love my job in private practice, but I genuinely miss academics. I was in too much of a hurry to get settled; I wish I would have known it's okay to take a little more time, take a little detour, and accept that an initial career goal may not be the ultimate one.

Curb Your Enthusiasm: The RAPTIR Could Bite!





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WHAT IS RAPTIR?

A posterior or retroclavicular approach to an infraclavicular brachial plexus block was first described by Hebbard and Royse[1] in a letter to the editor in 2007. However, results from the first clinical study of the technique were not published until 2015 by Charbonneau and colleagues.[2] It has subsequently been popularized as the retroclavicular approach to the infraclavicular region (RAPTIR) block.[3]

The technique is performed with the patient supine and the arm adducted. A high-frequency linear ultrasound transducer is placed inferiorly to the clavicle just medially to the coracoid process in the parasagittal plane such that the axillary vessels and cords of the brachial plexus are viewed in cross-section (Figure 1).[1,2] In this short axis view, the lateral cord appears in the anterocranial position, posterior cord in the posterocranial position, and median cord in the posterocaudal position (dependent on probe orientation and anatomic variation).[4] A needle insertion point is chosen in the supraclavicular fossa, between the clavicle and trapezius, so that the needle will pass behind the clavicle and enter the ultrasound image nearly parallel to the transducer (or perpendicular to the beam) (Figure 2).[1,2] A long (80–100 mm) needle is required given the distance from the supraclavicular fossa to the axillary artery. Because of the generally superior needle visualization achieved via a small angle of incidence of the needle relative to the ultrasound probe, an echogenic needle is generally not necessary.[5] A volume of 25–40 mL of local anesthetic is then injected to achieve perivascular spread.[2,6]

WHY IS RAPTIR BECOMING MORE POPULAR?

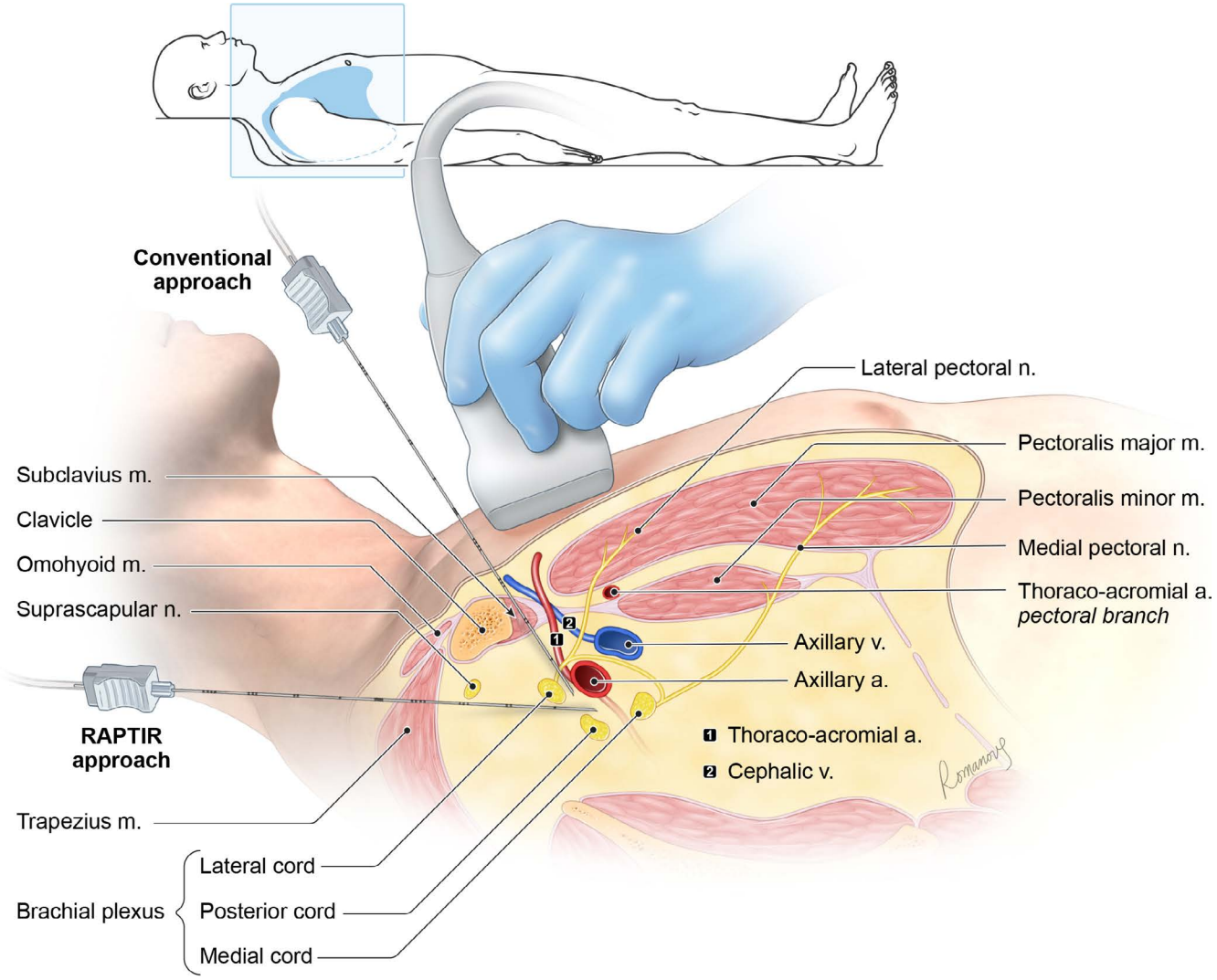
A recent systematic review including 25 randomized trials and 1,948 patients found no differences in success rate between supraclavicular, infraclavicular, or axillary brachial plexus blocks.[7] Infraclavicular block advantages include the ability to place a secure catheter and a decreased incidence of diaphragmatic paresis when compared to supraclavicular blocks.[2,8,9] Infraclavicular blocks are also associated with less tourniquet pain, more complete musculocutaneous nerve block than single injection axillary block, and decreased time to perform when compared to multiple injection axillary block.[10] However, needle visualization is often poor because of the steep angle of insertion with the conventional approach (Figures 3 and 4).[11] The median angle of insertion is 50 degrees (ranging from 33–60) and is made worse in obese patients, with the angle of insertion correlating with body mass index.[11] The RAPTIR block was developed to overcome this needle visualization challenge.[1]

A randomized trial comparing the conventional (coracoid) infraclavicular block to the RAPTIR block confirmed that needle shaft and tip visualization were significantly better with the RAPTIR technique, with similar success rates and patient satisfaction.[6] It also found that block performance time and paresthesias encountered during block placement were reduced when using the RAPTIR approach.[6] This may be because the lateral cord is commonly located in the needle path of a conventional infraclavicular block.[12]

The horizontal needle path of the RAPTIR block prevents that problem and avoids both the pectoral branch of the thoracoacromial artery and the cephalic vein (Figure 4).[12] The position of the needle relative to the clavicle is also advantageous for patients with limited range of shoulder motion or those with a painful upper extremity injury.[12,13] Whereas arm abduction improves needle angle and visualization in the conventional infraclavicular block, arm adduction improved needle insertion in the RAPTIR block.[5,14] For this reason, RAPTIR has been advocated as a pain control option for patients in the emergency department with upper extremity injury.[13]

"Infraclavicular blocks are also associated with less tourniquet pain, more complete musculocutaneous nerve block than single injection axillary block, and decreased time to perform when compared to multiple injection axillary block."

Figure 1: *Needle insertion for conventional and retroclavicular approaches and related anatomic structures.*



RAPTIR compares favorably to the supraclavicular approach, and a recent randomized controlled trial demonstrated similar success rates, pain control, and patient satisfaction.[15] Performance time for the RAPTIR was statistically longer. However, the absolute difference for performance time was less than 2 minutes and was therefore considered to not be clinically relevant.[15]

HOW DOES THE RAPTIR BITE?

Despite those advantages, the RAPTIR block is not without potential drawbacks. The major concern with the retroclavicular path is that the needle passes through an acoustic shadow behind the clavicle. Previously published cadaveric studies have demonstrated that the suprascapular nerve and suprascapular vein are vulnerable to injury because they are located along the needle trajectory of a RAPTIR block and in the clavicle's acoustic shadow.[16]

Neuromuscular stimulation during needle advancement through the acoustic window and monitoring for external rotation of the shoulder (supraspinatus and infraspinatus muscle stimulation) may reduce the incidence of inadvertent nerve injury.[16]

Infraclavicular brachial plexus blocks (whether conventional or retroclavicular) are classified as high risk for bleeding because of their noncompressible position under the clavicle and are not recommended for anticoagulated patients.[17] Additionally, because of the acoustic shadow casting a blind spot, pain physicians may advance the needle further than expected before locating it with the ultrasound transducer. That past pointing could result in nerve or vascular puncture or even pneumothorax. We recommend that the distance from the intended needle insertion point to the edge of the ultrasound transducer be measured externally once the optimal

Figure 2: *Needle insertion for RAPTIR (retroclavicular approach to the infraclavicular region).*

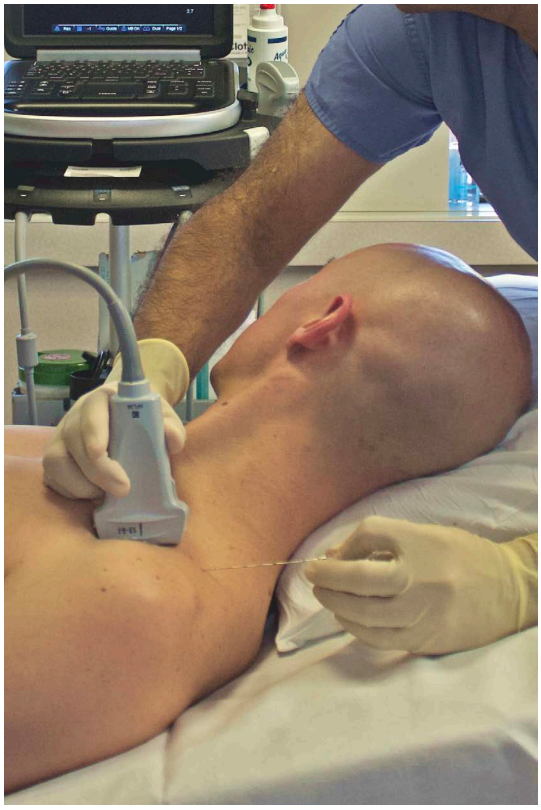


Figure 3: *Needle insertion for conventional ultrasound-guided infraclavicular brachial plexus block (coracoid approach).*

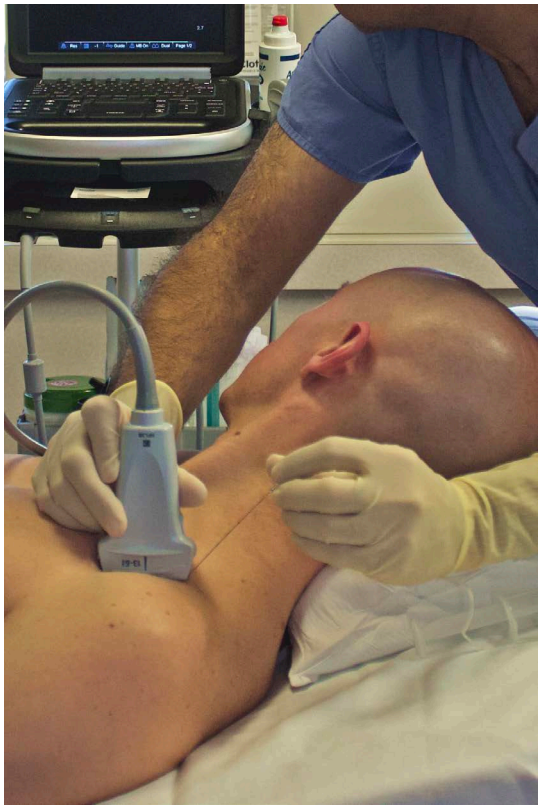


image has been obtained. Mark the needle shaft at that distance from the tip by grasping the shaft between index and thumb (Figure 5). Advance the needle past that point only once the tip is visualized in the ultrasound image.[5] Given that the needle path is horizontal and directed posteriorly to the axillary artery, spread to the lateral cords may be reduced, manifesting as a long onset time in the distribution of musculocutaneous nerve with RAPTIR, compared to conventional infraclavicular approach.[6]

One cadaver dissection showed less dye surrounding the medial and lateral cords than the posterior cord when using a retroclavicular approach.[18] However, as mentioned previously, a randomized trial found similar rates of sensory and motor block success, surgical success, supplementation, and analgesic use.[6] To maximize perivascular spread during a retroclavicular approach, we suggest using our 5-6-7 technique.[5] Advance the needle past the 6-o'clock point to the axillary artery as viewed in the ultrasound image. At 5-o'clock (posterocaudal) position, deposit 25% of the local anesthetic. Withdraw the needle and deposit 50% of the local anesthetic at the 6-o'clock position and 25% at the 7-o'clock position (Figure 6).

Figure 4: *Ultrasound image showing needle insertion for conventional and retroclavicular approaches and related anatomical structures. AA = axillary artery, CV = cephalic vein, LC = lateral cord, MC = medial cord, PC = posterior cord, TA = thoracoacromial artery.*

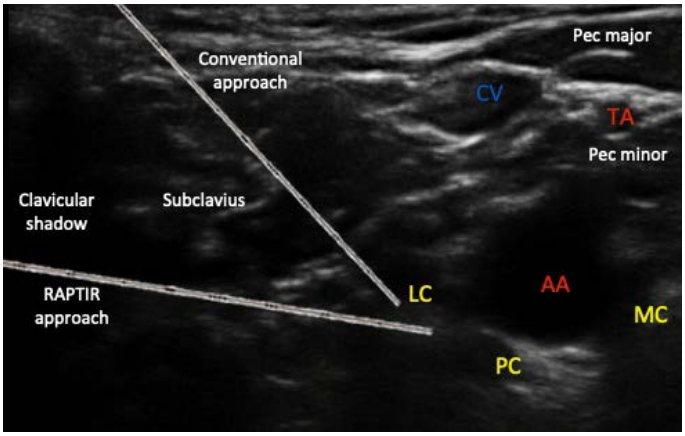


Figure 5: *Measurement of clavicle thickness before needle insertion for RAPTIR (retroclavicular approach to the infraclavicular region).*

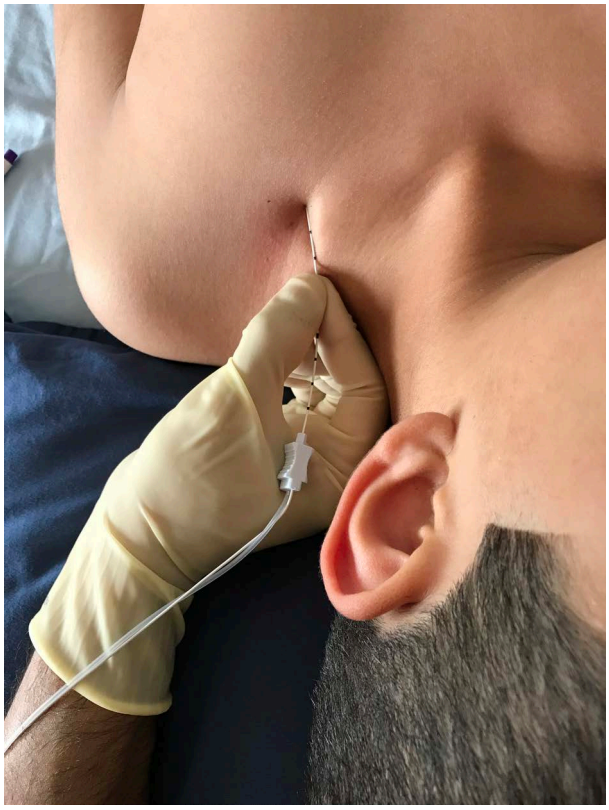
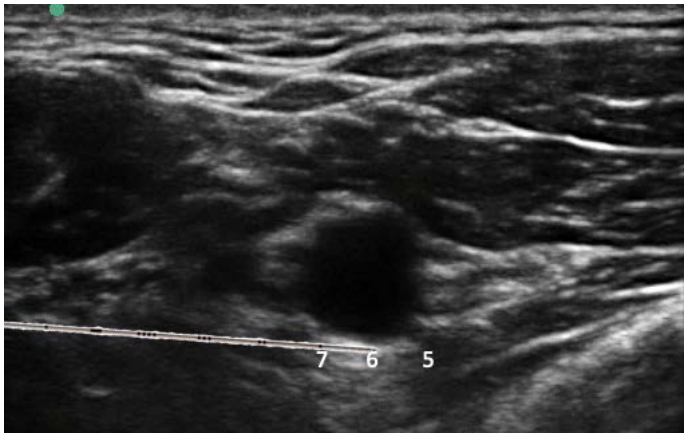


Figure 6: *Ultrasound image showing 5-6-7 technique (positions) to maximize perivascular spread during RAPTIR (retroclavicular approach to the infraclavicular region).*



Another potential problem is obtaining an optimal ultrasound image in a position that allows for the needle to pass easily behind the clavicle. The contour of the clavicle is highly variable, increasing the difficulty of a retroclavicular approach in a subset of patients with an acutely angulated clavicle, although the overall block performance time is not significantly different.[6,19,20] We suggest placing the patient's arm in an adducted position with slight downward traction to improve clavicle orientation.[5]

Finally, cadaveric studies have demonstrated the potential for a posterior cord injury with RAPTIR. Although the posterior cord is visible posteriorly to the axillary artery, in three of six cadaver dissections the posterior cord or its components were punctured by the needle.[16] We suggest hydrodissection of the posterior cord away from the axillary artery to allow needle passage. We also suggest using a neuromuscular stimulator and a low-pressure injection technique to minimize the chance of intraneural injection.[21,22]

CONCLUSION

Over the past few years, the RAPTIR block has seen rapidly growing enthusiasm. Although the approach offers some advantages to the conventional infraclavicular technique, it also carries some unique risks. We recommend that this relatively new technique should be used selectively rather than as a wholesale adoption above other methods of infraclavicular and other approaches to brachial plexus blockade, with the benefits and risks of the technique being considered in the context of patient habitus and comorbidities.

Specifically, the RAPTIR approach is well suited for patients where the needle insertion angle is expected to be steep because of a thick chest wall, limited range of shoulder motion, or securing an indwelling catheter.[23] The approach is less well suited for those with highly angulated clavicles, full supraclavicular fossae, and thin chest walls. Further research is needed, and we look forward to the results of a multicenter, randomized, noninferiority trial comparing conventional (coracoid) infraclavicular blocks to the RAPTIR method.[24]

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REFERENCES

1. Hebbard P, Royse C. Ultrasound guided posterior approach to the infraclavicular brachial plexus. Anaesthesia 2007;62:539. Available at: https://doi.org/10.1111/j.1365-2044.2007.05066.x.
2. Charbonneau J, Frechette Y, Sansoucy Y, Echave P. The ultrasound-guided retroclavicular block: a prospective feasibility study. Reg Anesth Pain Med 2015;40:605–609.

3. Smit J, Tang R, Vaghadia H, Sawka A. The ultrasound-guided retroclavicular block comparison with a novel subpectoral approach. Reg Anesth Pain Med 2016;41:290. Available at: https://doi.org/10.1097/AAP.0000000000000335.
4. Sauter AR, Smith HJ, Stubhaug A, Dodgson MS, Klaastad Ø. Use of magnetic resonance imaging to define the anatomical location closest to all three cords of the infraclavicular brachial plexus. Anesth Analg 2006;103:1571–1573.
5. Uppal V, Kalagara HKP, Sondekoppam RV. Tips and tricks to improve the safety of the retroclavicular brachial plexus block. Am J Emerg Med 2018;36:1107–1108.
6. Kavrut Ozturk N, Kavakli AS. Comparison of the coracoid and retroclavicular approaches for ultrasound-guided infraclavicular brachial plexus block. J Anesth 2017;31:572–578.
7. Albrecht E, Mermoud J, Fournier N, Kern C, Kirkham KR. A systematic review of ultrasound-guided methods for brachial plexus blockade. Anaesthesia 2016;71:213–227.
8. Koscielniak-Nielsen ZJ, Frederiksen BS, Rasmussen H, Hesselbjerg L. A comparison of ultrasound-guided supraclavicular and infraclavicular blocks for upper extremity surgery. Acta Anaesthesiol Scand 2009;53:620–626.
9. Petrar SD, Seltenrich ME, Head SJ, Schwarz SKW. Hemidiaphragmatic paralysis following ultrasound-guided supraclavicular versus infraclavicular brachial plexus blockade: a randomized clinical trial. Reg Anesth Pain Med 2015;40:133–138.
10. Chin K, Alakkad H, Adhikary S, Singh M. Infraclavicular brachial plexus block for regional anaesthesia of the lower arm. Cochrane Database Syst Rev 2013;8. Available at: https://doi.org/10.1002/14651858.CD005487.pub3.
11. Kalagara HKP, Uppal V, McKinlay S, MacFarlane AJR, Anderson K. Effect of body mass index on angle of needle insertion during ultrasound-guided lateral sagittal infraclavicular brachial plexus block. J Clin Anesth 2015;27:375–379.
12. Sutton EM, Bullock WM, Gadsden J. The retroclavicular brachial plexus block additional advantages. Reg Anesth Pain Med 2015;40:733–734.
13. Luftig J, Mantuani D, Herring AA, Nagdev A. Ultrasound-guided retroclavicular approach infraclavicular brachial plexus block for upper extremity emergency procedures. Am J Emerg Med 2017;35:773–777.
14. Auyong DB, Gonzales J, Benonis JG. The Houdini clavicle: arm abduction and needle insertion site adjustment improves needle visibility for the infraclavicular nerve block. Reg Anesth Pain Med 2010;35:403–404.
15. Grape S, Pawa A, Weber E, Albrecht E. Retroclavicular vs supraclavicular brachial plexus block for distal upper limb surgery: a randomised, controlled, single-blinded trial. Br J Anaesth 2019;122:518–524.
16. Sancheti SF, Uppal V, Sandeski R, Kwofie MK, Szerb JJ. A cadaver study investigating structures encountered by the needle during a retroclavicular approach to infraclavicular brachial plexus block. Reg Anesth Pain Med 2018;43:752–755.
17. Horlocker TT, Vandermeuelen E, Kopp SL, Gogarten W, Leffert LR, Benzon HT. Regional anesthesia in the patient receiving antithrombotic or thrombolytic therapy. Reg Anesth Pain Med 2018;43:263–309.
18. Beh ZY, Hasan MS, Lai HY, Kassim NM, Md Zin SR, Chin KF. Posterior parasagittal in-plane ultrasound-guided infraclavicular brachial plexus block—a case series. BMC Anesthesiol 2015;15:1–7.
19. Beh ZY, Hasan MS, Lai HY. Ultrasound-guided retroclavicular block (aka posterior approach infraclavicular block): anatomical variation of the clavicle limits block feasibility. Reg Anesth Pain Med 2016;41:658–659.
20. Huang JI, Toogood P, Chen MR, Wilber JH, Cooperman DR. Clavicular anatomy and the applicability of precontoured plates. J Bone Jt Surg 2007;89:2260–2265.
21. Klein SM, Melton MS, Grill WM, Nielsen KC. Peripheral nerve stimulation in regional anesthesia. Reg Anesth Pain Med 2012;37:383–392.
22. Tsui BCH, Li LXY, Pillay JJ. Compressed air injection technique to standardize block injection pressures. Can J Anesth 2006;53:1098–1102.
23. Uppal V, Sancheti SF, Kwofie MK, Szerb JJ. Novel approaches to the brachial plexus in the infraclavicular space: filling up the tool box. Reg Anesth Pain Med 2019. Available at: https://doi.org/10.1136/rapm-2018-100238.
24. Langlois PL, Gil-Blanco AF, Jessop D, et al. Retroclavicular approach vs infraclavicular approach for plexic bloc anesthesia of the upper limb: study protocol randomized controlled trial. Trials 2017;18:1–9.

Postmastectomy Pain Syndrome: Presentation and Management

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EPIDEMIOLOGY

Breast cancer is the most common cancer among women in the United States. An estimated one of eight women will develop breast cancer in her lifetime, resulting in approximately 300,000 new cases per year.[1]

Postmastectomy pain syndrome (PMPS) itself is not a specific diagnosis but rather describes a cluster of symptoms frequently observed in breast cancer survivors following treatment. Its name is a misnomer, because symptoms and impairments can be seen following mastectomy, lumpectomy, lymph node dissection, and reconstruction, as well as chemotherapy and radiation. Generally, it is considered to be chronic breast or chest wall pain lasting at least 3 months following cancer treatment.[2] Although an exact definition or specific criteria have not been established, incidence rates are estimated at 40–50%.[1,3] Cancer rehabilitation physicians, as subspecialists of physical medicine and rehabilitation, diagnose and treat PMPS as part of comprehensive breast cancer rehabilitation programs.

CLINICAL PRESENTATION AND DIFFERENTIAL DIAGNOSIS

Many patients will experience short-term nociceptive pain after breast cancer treatment. However, with PMPS, patients frequently experience persistent neuropathic-type pain: burning, tingling, aching, a subjective sense of "tightness" around the chest wall, or even phantom breast or nipple pain. Neuropathic pain results from dysfunction of the peripheral nerves caused by surgery, radiation, or neurotoxic chemotherapies.[4]

"Many patients will experience short-term nociceptive pain after breast cancer treatment. However, with PMPS, patients frequently experience persistent neuropathic-type pain."

Neuromas, frequently found in scars following breast or axillary incisions, are one cause of neuropathic pain and can become chronic. Although they can occur after simple lumpectomies, they are more common following more extensive surgeries such as axillary lymph node dissections (ALNDs) and with the addition of radiation.[5] Damaged nerves are easily excitatory, sending a constant barrage of painful impulses with the slightest mechanical distortion.[6] Commonly transected nerves include intercostal, thoracodorsal, medial and lateral pectoral, and long thoracic nerves.[7]

A well-recognized cause of PMPS is intercostobrachial neuralgia. The intercostobrachial nerve is the lateral cutaneous branch of the second intercostal nerve, arising from T2. It provides sensation to the medial upper arm, axilla, and lateral chest wall. It is frequently sacrificed during ALND and almost always results in numbness. However, in symptomatic patients, it can result in painful paresthesias and chronic neuropathic pain.[8]

Musculoskeletal pain syndromes are a common cause of nociceptive-type pain and, when chronic, should be included in the definition of PMPS. Chest wall pain that is persistent beyond simple incisional pain can be the result of scarring of the incised tissues, leading to hypomobile tissue adhered to the underlying chest wall. Another example of postmastectomy musculoskeletal pain is rotator cuff dysfunction. One cause of this is the result of changes in scapulothoracic motion.[9] Pectoralis major muscle tightness or spasms, resulting from tissue expanders or radiation, pull the acromion into a protracted and inferior position and lessen the subacromial space through which the rotator cuff tendons pass, causing rotator cuff tendinopathies.[10]

ETIOLOGY

The etiology of PMPS is multifactorial. The severity of postoperative pain has been shown to increase the risk of developing chronic pain in various surgeries with the hypothesis of central desensitization.[11] In a study by Tasmuth et al,[12] patients with chronic breast pain used significantly more analgesics in the 48 hours following surgery than those without chronic pain. This is especially important given that postoperative pain is a modifiable risk factor, using preoperative analgesia and nerve blocks.

Table 1: *Common medications used to treat PMPS.*[25,26]

Class	Medication name
Antiepileptics	Gabapentin, pregabalin
Tricyclic antidepressants	Amitriptyline, imipramine, nortriptyline
Serotonin–norepinephrine reuptake inhibitors	Duloxetine, venlafaxine
Topical compounds	Lidocaine, capsaicin

PMPS, postmastectomy pain syndrome.

Researchers have hypothesized that younger patients are more predisposed to developing chronic pain, including PMPS.[13] Younger patients may be more sensitive to nerve damage, have higher preoperative anxiety, and receive more aggressive treatment.[14] Surgical factors contributing to PMPS include a more extensive axillary lymph node dissection because it leads to greater injury of the intercostobrachial nerve, resulting in neuropathic pain.[15,16] Postoperative radiation therapy to the axilla increases nerve damage and can lead to persistent pain that can last months to years following treatment, even in patients who undergo breast conservation surgery.[12] Psychosocial factors such as depression, anxiety, and catastrophizing have been shown to increase postoperative pain and chronic pain following breast surgery,[17] but this is another modifiable risk factor.[18]

Treatment of PMPS includes rehabilitation interventions, medications, and interventional procedures. Stretching and active exercises are used to treat impaired range of motion of the shoulder and strengthen scapular stabilizers, and myofascial techniques are helpful for incisional pain and axillary cording.[4,19] Pharmacologic interventions are aimed at reducing neuropathic pain (see Table 1 for commonly prescribed medications). Interventional techniques include intercostobrachial nerve blocks and the superficial and deep serratus blocks.[20,21] Hydrodissection of the pectoralis muscles can alleviate pain after reconstruction.

Risk reduction strategies include maximizing perioperative pain management with gabapentin, venlafaxine, and topical lidocaine.[22,23] Paravertebral and pectoral nerve blocks have been used to limit postoperative pain, with the potential of reducing the development of chronic pain.[24] Providing perioperative psychosocial support may enhance postoperative recovery and decrease the incidence of chronic breast pain.

SUMMARY

PMPS is a constellation of symptoms leading to chronic breast and chest wall pain in patients with breast cancer and impairing quality of life. Future research is needed to improve recognition, risk factor modification, and treatment.

REFERENCES

1. DeSantis CE, Ma J, Goding Sauer A, Newman LA, Jemal A. Breast cancer statistics, 2017, racial disparity in mortality by state. CA Cancer J Clin 2017;67(6):439–448.
2. Meijuan Y, Zhiyou P, Yuwen T, Ying F, Xinzhong C. A retrospective study of postmastectomy pain syndrome: incidence, characteristics, risk factors, and influence on quality of life. ScientificWorldJournal 2013;159732. Available at: https://doi.org/10.1155/2013/159732.
3. Alves Nogueira Fabro E, Bergmann A, do Amaral ESB, et al. Post-mastectomy pain syndrome: incidence and risks. Breast 2012;21(3):321–325.
4. Wisotzky E, Hanrahan N, Lione TP, Maltser S. Deconstructing postmastectomy syndrome: implications for physiatric management. Phys Med Rehabil Clin N Am 2017;28:153–169.
5. Rosso R, Scelsi M, Carnevali L. Granular cell traumatic neuroma: a lesion occurring in mastectomy scars. Arch Pathol Lab Med 2000;124:709–711.
6. Wall PD, Gutnick M. Ongoing activity in peripheral nerves: the physiology and pharmacology of impulses originating from a neuroma. Exp Neurol 1974;43:580–593.
7. Wallace AM, Wallace MS. Postmastectomy and postthoracotomy pain. Anesthesiol Clin N Am 1997;15:353–370.
8. Stubblefield MD, Custodio CM. Upper-extremity pain disorders in breast cancer. Arch Phys Med Rehabil 2006;87(3):96–99.
9. Shamley D, Srinaganathan R, Oskrochi R, Lascurain-Aguirrebeña I, Sugden E. Three-dimensional scapulothoracic motion following treatment for breast cancer. Breast Cancer Res Treat 2009;118:315. Available at: https://doi.org/10.1007/s10549-008-0240-x.
10. Shamley D, Lascurain-Aguirrebeña I, Oskrochi R, Srinaganathan R. Shoulder morbidity after treatment for breast cancer is bilateral and greater after mastectomy. Acta Oncol 2012;51:1045–1053.
11. Katz J, Poleshuck EL, Andrus CH, et al. Risk factors for acute pain and its persistence following breast cancer surgery. Pain 2005;119:16–25.
12. Tasmuth T, Kataja M, Blomqvist C, et al. Treatment-related factors predisposing to chronic pain in patients with breast cancer—a multivariate approach. Acta Oncol 1997;36:625–630.
13. Smith WC, Bourne D, Squair J, et al. A retrospective cohort study of post mastectomy pain syndrome. Pain 1999;83:91–95.
14. Fecho K, Miller NR, Merritt SA, et al. Acute and persistent postoperative pain after breast surgery. Pain Med 2009;10:708–715.
15. Miguel R, Kuhn AM, Shons AR, et al. The effect of sentinel node selective axillary lymphadenectomy on the incidence of postmastectomy pain syndrome. Cancer Control 2001;8:427–430.
16. Steegers MA, Wolters B, Evers AW, et al. Effect of axillary lymph node dissection on prevalence and intensity of chronic and phantom pain after breast cancer surgery. J Pain 2008;9:813–822.
17. Nishimura D, Kosugi S, Onishi Y, et al. Psychological and endocrine factors and pain after mastectomy. Eur J Pain 2017;21:1144–1153.
18. Tasmuth T, von Smitten K, Hietanen P, Kataja M, Kalso E. Pain and other symptoms after different treatment modalities of breast cancer. Ann Oncol 1995;6:453–459.
19. De Groef A, Van Kampen M, Dieltjens E, et al. Effectiveness of postoperative physical therapy for upper-limb impairments after breast cancer treatment: a systematic review. Arch Phys Med Rehabil 2015;96:1140–1153.
20. Wisotzky EM, Saini V, Kao C. Ultrasound-guided intercostobrachial nerve block for intercostobrachial neuralgia in breast cancer patients: a case series. PM R 2016;8:273–277.

21. Zocca JA, Chen GH, Puttanniah VG, et al. Ultrasound-guided serratus plane block for treatment of postmastectomy pain syndromes in breast cancer patients: a case series. Pain Pract 2017;17:141–146.
22. Fassoulaki A, Patris K, Sarantopoulos C, Hogan Q. The analgesic effect of gabapentin and mexiletine after breast surgery for cancer. Anesth Analg 2002;95:985–991.
23. Amr YM, Yousef AA. Evaluation of efficacy of the perioperative administration of venlafaxine or gabapentin on acute and chronic postmastectomy pain. Clin J Pain 2010;26:381–385.
24. Kairaluoma PM, Bachmann MS, Rosenberg PH, Pere PJ. Preincisional paravertebral block reduces the prevalence of chronic pain after breast surgery. Anesth Analg 2006;103:703–708.
25. Tasmuth T, Härtel B, Kalso E. Venlafaxine in neuropathic pain following treatment of breast cancer. Eur J Pain 2002;6:17–24.
26. Cheville AL, Sloan JA, Northfelt DW, et al. Use of lidocaine patch in the management of postsurgical neuropathic pain in patients with cancer: a phase III double-blind crossover study. Support Care Cancer 2009;17:451–460.

PRO Advantages of Liposomal Bupivacaine for Postoperative Analgesia

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The duration of postoperative pain is frequently greater than the duration of a single administration of local anesthetic. Local anesthetic may be encased in liposomes which, as they break down, release medication over a period of multiple days and increase the duration of action.[1] In 2011, the first formulation of liposomal bupivacaine (LB) (Exparel; Pacira Pharmaceuticals, Inc., USA) was approved by the US Food and Drug Administration (FDA). It is now approved for use in surgical site infiltration, transversus abdominis plane blocks, and interscalene nerve blocks for shoulder surgery. Although evidence of LB's superiority over normal saline may be found—validating prolonged analgesic effects[2–5]—we will limit our discussion here to the more clinically relevant comparison of LB and unencapsulated local anesthetics ("standard" bupivacaine HCl). Similarly, with a plethora of randomized, controlled trials (RCTs) now published, we will focus on these investigations over retrospective cohort studies.

SURGICAL INFILTRATION

Four RCTs involving three different types of surgical procedures produced evidence demonstrating benefits of LB over bupivacaine HCl. LB infiltration improved analgesia over bupivacaine HCl following breast augmentation in one study. However, the authors concluded that "although there is a statistically significant decrease in postoperative pain with the use of LB, this may not translate to an appreciable clinical benefit that justifies the additional cost" because the improvement in pain scores was less than 1 on a 10-point pain scale.[6] Conversely, two additional investigations were unable to show statistically significant differences with a similar primary end point, raising further doubt on the findings of the initial positive study.[7,8]

"For surgical infiltration of liposomal bupivacaine, RCTs provide sparse high-quality evidence suggesting a switch from unencapsulated local anesthetic is warranted. What little positive evidence exists is, at best, equivocal."

Other studies on surgical infiltration have been of patients undergoing hemorrhoidectomy, inguinal hernia repair, or laparoscopic urologic surgery. In patients undergoing hemorrhoidectomy, one RCT reported decreased pain with LB infiltration,[9] whereas another had negative findings.[7] Additional RCTs were uniformly negative for their primary end point for inguinal hernia repair[7,10,11] and laparoscopic urologic surgery.[12]

Thirteen published RCTs involve the use of LB infiltration of the knee joint following arthroplasty.[13] Two trials reported positive results in favor of LB over bupivacaine HCl; however, one of those studies was not prospectively registered nor was a primary end point defined and therefore has questionable data integrity.[14] The other "positive" RCT was the Postsurgical Infiltration with LB for Long Lasting Analgesia in total knee aRthroplasty (PILLAR) study.[15] However, as Shafer[16] described, the study results are negative if the original statistical methods published prior to enrollment were followed. Instead and without explanation, the investigators performed a post hoc one-sided statistical analysis (instead of the prespecified two-sided analysis), ignored a Bonferroni penalty for multiple primary end points, and "propagated the type I error to the analysis of opioid consumption . . . rendering invalid the finding of a statistically significant reduction in opioid consumption."[15,16] Thus, the positive evidence of benefit pales relative to the negative findings of the remaining 11 RCTs.

When compared with a single-injection femoral nerve block of unencapsulated bupivacaine, surgically infiltrated LB results in a higher percentage of patients able to perform a straight leg raise the day of surgery and decreased opioid consumption the day following surgery.[17] However, the value of this is questionable given that LB also provides inferior analgesia and thus results in greatly increased opioid use the day of surgery.[17] Similar inferior analgesia

of infiltrated LB has been documented in RCTs involving knee and shoulder surgery for both single-injection[18–20] and continuous peripheral nerve blocks.[21,22]

The one exception is an RCT in which all subjects having shoulder arthroplasty received a single-injection interscalene block with unencapsulated bupivacaine followed by either surgical infiltration with LB or an interscalene perineural catheter and 100-hour bupivacaine HCl (0.125%) infusion.[23] The primary end points of pain scores and opioid use within the first 24 hours were both negative, as were comparisons for subsequent time points up to 48 hours. This was a superiority study and, therefore, a lack of statistically significant differences in analgesia and opioid use must not be interpreted as equivalence; rather, the study is simply inconclusive. However, two of three patient-reported outcome measures—the American Shoulder and Elbow Surgeons as well as Penn shoulder scores—were improved for subjects who received LB infiltration at the final surgical follow-up visit. Unfortunately, the risk of a type 1 error is high because more than 50 comparisons were reported without any statistical correction. Nonetheless, if future studies demonstrated at least noninferior analgesia and opioid requirements with LB compared with a perineural unencapsulated local anesthetic infusion, it could decrease administration time, catheter-related complications, and possibly costs.[24,25]

In summary, for surgical infiltration of liposomal bupivacaine, RCTs provide sparse high-quality evidence suggesting a switch from unencapsulated local anesthetic is warranted. What little positive evidence exists is, at best, equivocal.

PERIPHERAL NERVE BLOCKS

In contrast, some promising results involve LB when administered as part of a single-injection peripheral nerve block.[26–28] Adding LB to standard bupivacaine for interscalene brachial plexus blocks lowered patients' worst pain scores with major shoulder surgery.[28] In that study, all subjects received 5 mL of bupivacaine HCl (0.25%) and were randomly assigned to receive 10 mL of either additional unencapsulated bupivacaine or LB. The primary outcome of interest was worst pain in the first postoperative week. Overall, the liposomal group had modest improvements in the primary outcome (by about 1.5 points on the numerical rating scale) as well as improvement in overall benefit of analgesia scores. No differences were found in additional secondary outcomes, including daily worst pain scores, although the study was not powered to detect such differences. Unfortunately, average and median pain scores were not included in the results and a lack of differences between the treatments in time to first opioid request, total opioid consumption, and sleep duration makes interpreting the results more challenging.

Two prospective RCTs investigating the benefits of LB for subcostal transversus abdominis plane blocks reported decreased pain scores and opioid requirement for up to 72 hours after robot-assisted hysterectomy and laparoscopic hand-assisted donor nephrectomy.[26,27] Unfortunately, both were registered only after enrollment was completed and one did not specify a primary outcome measure without any correction for multiple end-point comparisons.[27] How bupivacaine HCl would provide inferior analgesia immediately after surgery is unclear, considering it theoretically provides a denser block compared to the prolonged release of bupivacaine in its liposomal form. In fact, the manufacturer and FDA revised the label to specifically permit the mixing of LB and bupivacaine HCL to increase potency.

LB may be of use in other anatomic locations that have yet to be FDA approved. For example, when used in a femoral nerve block, LB demonstrated analgesic effects for as long as 72 hours.[4] A future trial should compare the use of LB to that of bupivacaine HCl. Another investigation examined the use of LB for single-injection epidural blocks in healthy volunteers.[29] The findings were promising, in which LB at the current maximum-approved dose of 266 mg resulted in longer duration of sensory blockade and shorter duration of motor block as compared to unencapsulated bupivacaine.

In summary, the available evidence for liposomal bupivacaine in peripheral and epidural nerve blocks appears promising; therefore, future large-scale, high-quality RCTs (and additional FDA approval) are greatly needed to definitively determine the relative risks and benefits of using LB as part of a single-injection nerve block.

REFERENCES

1. Boogaerts JG, Lafont ND, Declercq AG, et al. Epidural administration of liposome-associated bupivacaine for the management of postsurgical pain: a first study. J Clin Anesth 1994;6:315–320.
2. Golf M, Daniels SE, Onel E. A phase 3, randomized, placebo-controlled trial of DepoFoam® bupivacaine (extended-release bupivacaine local analgesic) in bunionectomy. Adv Ther 2011;28:776–788.
3. Gorfine SR, Onel E, Patou G, Krivokapic ZV. Bupivacaine extended-release liposome injection for prolonged postsurgical analgesia in patients undergoing hemorrhoidectomy: a multicenter, randomized, double-blind, placebo-controlled trial. Dis Colon Rectum 2011;54:1552–1529.
4. Hadzic A, Minkowitz HS, Melson TI, et al. Liposome bupivacaine femoral nerve block for postsurgical analgesia after total knee arthroplasty. Anesthesiology 2016;124:1372–1383.
5. Ilfeld BM, Malhotra N, Furnish TJ, Donohue MC, Madison SJ. Liposomal bupivacaine as a single-injection peripheral nerve block: a dose-response study. Anesth Analg 2013;117:1248–1256.
6. Nadeau MH, Saraswat A, Vasko A, Elliott JO, Vasko SD. Bupivacaine versus liposomal bupivacaine for postoperative pain control after augmentation mammaplasty: a prospective, randomized, double-blind trial. Aesthet Surg J 2016;36:NP47–NP52.
7. Bergese SD, Ramamoorthy S, Patou G, Bramlett K, Gorfine SR, Candiotti KA. Efficacy profile of liposome bupivacaine, a novel formulation of bupivacaine for postsurgical analgesia. J Pain Res 2012;5:107–116.
8. Smoot JD, Bergese SD, Onel E, Williams HT, Hedden W. The efficacy and safety of DepoFoam bupivacaine in patients undergoing bilateral, cosmetic, submuscular augmentation mammaplasty: a randomized, double-blind, active-control study. Aesthet Surg J 2012;32:69–76.

9. Haas E, Onel E, Miller H, Ragupathi M, White PF. A double-blind, randomized, active-controlled study for post-hemorrhoidectomy pain management with liposome bupivacaine, a novel local analgesic formulation. Am Surg 2012;78:574–581.
10. Langford RM, Chappell GM, Karrasch JA. A single administration of depobupivacaine intraoperatively results in prolonged detectable plasma bupivacaine and analgesia in patients undergoing inguinal hernia repair. Presented at: the Annual Postgraduate Assembly in Anesthesiology of the New York State Society of Anesthesiologists; December 2008; New York, NY. Abstract p-9088.
11. White PF, Schooley GL, Ardeleanu M. Analgesia following a single administration of depobupivacaine intraoperatively in patients undergoing inguinal herniorrhaphy: preliminary dose-ranging studies (abstract s-242). Anesth Analg 2009;108(suppl 3S):S242.
12. Knight RB, Walker PW, Keegan KA, et al. A randomized controlled trial for pain control in laparoscopic urologic surgery: 0.25% bupivacaine versus long-acting liposomal bupivacaine. J Endourol 2015;29:1019–1024.
13. Ilfeld BM, Gabriel RA, Eisenach JC. Liposomal bupivacaine infiltration for knee arthroplasty: significant analgesic benefits or just a bunch of fat? Anesthesiology 2018;129:623–626.
14. Snyder MA, Scheuerman CM, Gregg JL, Ruhnke CJ, Eten K. Improving total knee arthroplasty perioperative pain management using a periarticular injection with bupivacaine liposomal suspension. Arthroplast Today 2016;2:37–42.
15. Mont MA, Beaver WB, Dysart SH, Barrington JW, Del Gaizo DJ. Local infiltration analgesia with liposomal bupivacaine improves pain scores and reduces opioid use after total knee arthroplasty: results of a randomized controlled trial. J Arthroplasty 2018;33:90–96.
16. Shafer SL. Letter to the editor on "local infiltration analgesia with liposomal bupivacaine improves pain scores and reduces opioid use after total knee arthroplasty: results of a randomized controlled trial." J Arthroplasty 2018;33:2694. Available at: https://doi.org/10.1016/j.arth.2018.03.032.
17. Surdam JW, Licini DJ, Baynes NT, Arce BR. The use of Exparel (liposomal bupivacaine) to manage postoperative pain in unilateral total knee arthroplasty patients. J Arthroplasty 2015;30:325–329.
18. Okoroha KR, Keller RA, Marshall NE, et al. Liposomal bupivacaine versus femoral nerve block for pain control after anterior cruciate ligament reconstruction: a prospective randomized trial. Arthroscopy 2016;32:1838–1845.
19. Okoroha KR, Lynch JR, Keller RA, et al. Liposomal bupivacaine versus interscalene nerve block for pain control after shoulder arthroplasty: a prospective randomized trial. J Shoulder Elbow Surg 2016;25:1742–1748.
20. Namdari S, Nicholson T, Abboud J, Lazarus M, Steinberg D, Williams G. Randomized controlled trial of interscalene block compared with injectable liposomal bupivacaine in shoulder arthroplasty. J Bone Joint Surg Am 2017;99:550–556.
21. Abildgaard JT, Lonergan KT, Tolan SJ, et al. Liposomal bupivacaine versus indwelling interscalene nerve block for postoperative pain control in shoulder arthroplasty: a prospective randomized controlled trial. J Shoulder Elbow Surg 2017;26:1175–1181.
22. Amundson AW, Johnson RL, Abdel MP, et al. A three-arm randomized clinical trial comparing continuous femoral plus single-injection sciatic peripheral nerve blocks versus periarticular injection with ropivacaine or liposomal bupivacaine for patients undergoing total knee arthroplasty. Anesthesiology 2017;126:1139–1150.
23. Sabesan VJ, Shahriar R, Petersen-Fitts GR, et al. A prospective randomized controlled trial to identify the optimal postoperative pain management in shoulder arthroplasty: liposomal bupivacaine versus continuous interscalene catheter. J Shoulder Elbow Surg 2017;26:1810–1817.
24. Corman S, Shah N, Dagenais S. Medication, equipment, and supply costs for common interventions providing extended post-surgical analgesia following total knee arthroplasty in US hospitals. J Med Econ 2018;21:11–18.
25. Ilfeld BM. Continuous peripheral nerve blocks: an update of the published evidence and comparison with novel, alternative analgesic modalities. Anesth Analg 2017;124:308–335.
26. Hutchins J, Delaney D, Vogel RI, et al. Ultrasound guided subcostal transversus abdominis plane (tap) infiltration with liposomal bupivacaine for patients undergoing robotic assisted hysterectomy: a prospective randomized controlled study. Gynecol Oncol 2015;138:609–613.
27. Hutchins JL, Kesha R, Blanco F, Dunn T, Hochhalter R. Ultrasound-guided subcostal transversus abdominis plane blocks with liposomal bupivacaine vs. non-liposomal bupivacaine for postoperative pain control after laparoscopic hand-assisted donor nephrectomy: a prospective randomised observer-blinded study. Anaesthesia 2016;71:930–937.
28. Vandepitte C, Kuroda M, Witvrouw R, et al. Addition of liposome bupivacaine to bupivacaine hcl versus bupivacaine hcl alone for interscalene brachial plexus block in patients having major shoulder surgery. Reg Anesth Pain Med 2017;42:334–341.
29. Viscusi ER, Candiotti KA, Onel E, Morren M, Ludbrook GL. The pharmacokinetics and pharmacodynamics of liposome bupivacaine administered via a single epidural injection to healthy volunteers. Reg Anesth Pain Med 2012;37:616–622.

CON Liposomal Bupivacaine: A Mission Incomplete

An anesthetist's dream of having a long-acting, nonaddictive solution for the management of postoperative pain is a long-standing affair. Liposomal bupivacaine (LB), with its prolonged half-life and a longer duration of analgesia,[1] was purported to meet that objective. Unfortunately, the available scientific data on LB has been inconclusive. Various publications have highlighted the dominance of LB over plain bupivacaine. However, the observed worthiness of LB calls for inclusion of more nonindustrial trials and consideration of additional viewpoints.[2]

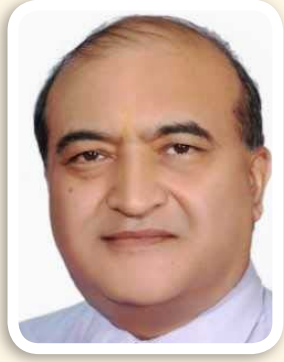
To be useful for clinical practice, any new drug should have low cost, ease of availability, multiple routes of administration, explicit clinical benefits over the current standards of care, reduced toxicity, high-quality evidence-based indications, predictable pharmacology, and regulatory approval for its clinical use. In those contexts, the current evidence for LB has so far been inconsistent. A Cochrane review described some of LB's usefulness in comparison to placebo but not to bupivacaine or other analgesics.[3]

Published scientific literature that includes phase II and III trials is inconclusive in building an opinion of approval or rejection of LB for management of postoperative pain. Pertinent issues requiring clarification include safety, analgesic efficacy, opioid-related issues, motor function, status of postoperative chronic pain, and cost effectiveness.[4,5]

The highlighted benefits of LB fail to extrapolate into clinical practice because of a deficiency in a number of randomized controlled trials (RCTs) and advice on judicious interpretation of results.[6] Scarce data are available to approve LB for nerve blocks,[7] and widespread clinical use is not justified in the context of its exorbitant cost.[8] Supporting reviews on LB are also limited by publication bias and short-term follow-up.[9] Reviews and meta-analyses on LB lament issues related to limited sample size, number of RCTs, study design, and optimal dosing.[10,11]

"The highlighted benefits of LB fail to extrapolate into clinical practice because of a deficiency in number of randomized controlled trials (RCTs) and advice on judicious interpretation of results."

Nanolipid particles were acknowledged in 1965 as a drug vehicle to control the release and to improve the effects of local anesthetics.[12] In 2011, the United States Food and Drug Administration (FDA) granted approval to use LB as a single-dose surgical site infiltration intended to provide postoperative analgesia.[7,13] However, despite a long history, LB is still considered investigational and is in pursuit of an appropriate representation in the armamentarium of anesthetists. A change in study design, inclusion criteria, and consideration of more painful surgeries has been advised for future trials.[7] Available studies with comparable,[14–16] negative,[5,17–19] or beneficial outcomes[10, 20–22] on LB also suffer from suboptimal quantity and quality of evidence.



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REGULATORY ISSUES AND SCOPE OF APPLICABILITY

In the beginning, LB was granted approval for providing postoperative analgesia with surgical site infiltration in hemorrhoidectomy and bunionectomy. Later, approval was extended to include other surgeries as well.[23] Hence, most of the data on LB relate to infiltration use. Transverse abdominal plane block was later added,[24] but the data on those blocks have not been convincing.[7] Wider indications are being explored for LB.[25] Data on LB for perineural use and for postoperative pain management are scarce, and those available have been inconclusive to guide users, policy makers, or sponsors.[7]

Results on perineural use of LB have been discouraging too. LB was associated with increased nociception because of femoral nerve irritation following a femoral nerve block in anterior crucial ligament reconstruction surgeries.[26] Current data failed to demonstrate meaningful postoperative outcomes, including reduction in opioid consumption or resource use.[27] A meta-analysis demonstrated equivalent pain control with LB infiltration or interscalene block (ISB) and recommended additional high-quality RCTs and longer follow-up to properly compare LB's efficacy and safety.[28]

Despite this, the FDA added ISB for shoulder surgeries to its approved list of LB indications, based on a single publication.[29]

PHARMACOECONOMICS OF LB

The cost effectiveness of using LB is questionable and remains a barrier that limits more widespread use. A 20-mL vial of LB is $285, whereas the same volume of bupivacaine costs only $1.15.[30] This translates to LB being more than 100 times more expensive than conventional bupivacaine. The high cost of LB is prone to generate availability issues in developing countries; therefore,

robust randomized trials are necessary to demonstrate LB's actual cost effectiveness. In addition, no data are available on health economics for the use of analgesics after 72 hours.[7]

PHARMACOLOGIC ISSUES

Stability of LB solution in a mixture of other drugs is uncertain and the release for periarticular infiltration is unpredictable because of negligible data. In vitro pharmacologic studies are needed to assess potential systemic toxicities.[31]

Because of a paucity of data, commenting on LB's adverse effects is difficult. The frequency of adverse effects is either comparable or lower than that of bupivacaine. Side effects include fever, gastrointestinal disturbances, and irritation at the site of injection.[32] Others have reported fecal incontinence,[33] platelets inhibition,[34] and femoral nerve palsy.[2] LB has also been implicated in prolonging inflammation and producing myotoxic effects.[33] LB should be used with caution in those at elevated risk for the development of compartment syndrome because of the scarcity of data regarding its onset of action, duration of sensorimotor blockade, and offsetting of effects.[35]

NEWER, EXTENDED-RELEASE LB

In a recent review, extended-release LB like HTX-011 and SABER bupivacaine have shown promising initial results in safety and efficacy; however, the studies tend to be sponsored by drug companies and caution must be exercised when interpreting the findings. For now, only LB has FDA-approved indications for clinical use. More studies are thus required to formulate an opinion on these agents.[36] Extended-release LB SABER requires additional clinical studies to assess safety and efficacy.[37]

FINAL VERDICT

LB is far from meeting expectations because of the paucity of robust studies. Additional areas of research could include robust comparisons of LB with continuous administration of conventional bupivacaine via perineural catheters or with single administration of conventional bupivacaine in combination with adjuvants. More studies on cost benefits are necessary, given LB's cost. Newer evidence-based findings are essential to modify current judgement on LB.

REFERENCES

1. Olson MD, Moore EJ, Price DL. A randomized single-blinded trial of posttonsillectomy liposomal bupivacaine among adult patients. Otolaryngol Head Neck Surg 2018;159:835–842.
2. Schroer WC, Diesfeld PG, LeMarr AR, Morton DJ, Reedy ME. Does extended-release liposomal bupivacaine better control pain than bupivacaine after total knee arthroplasty (TKA): a prospective, randomized clinical trial. J Arthroplasty 2015;30(suppl 9):64–67.
3. Hamilton TW, Athanassoglou V, Mellon S, et al. Liposomal bupivacaine infiltration at the surgical site for the management of postoperative pain. Cochrane Database Syst Rev 2017;2:CD011419. Available at: https://doi.org/10.1002/14651858.CD011419.pub2.
4. Alijanipour P, Tan TL, Matthews CN, et al. Peri-articular injection of liposomal bupivacaine offers no benefit over standard bupivacaine in total knee arthroplasty: a prospective, randomized, controlled trial. J Arthroplasty 2017;32:628–634.
5. Uskova A, O'Connor JE. Liposomal bupivacaine for regional anesthesia. Curr Opin Anesthesiol 2015;28:593–597.
6. Raman S, Lin M, Krishnan N. Systematic review and meta-analysis of the efficacy of liposomal bupivacaine in colorectal resections. J Drug Assess 2018;7:43–50.
7. Hamilton TW, Athanassoglou V, Trivella M, et al. Liposomal bupivacaine peripheral nerve block for the management of postoperative pain. Cochrane Database Syst Rev 2016;8:CD011476. Available at: https://doi.org/10.1002/14651858.CD011476.pub2.
8. Noviasky JN, Pierce DP, Whalen K, Guharoy R, Hildreth K. Bupivacaine liposomal versus bupivacaine: comparative review. Hosp Pharm 2014;49:539–543.
9. Zhang X, Yang Q, Zhang Z. The efficiency and safety of local liposomal bupivacaine infiltration for pain control in total hip arthroplasty: a systematic review and meta-analysis. Medicine 2017;96:e8433. Available at: https://doi.org/10.1097/MD.0000000000008433.
10. Wu ZQ, Min JK, Wang D, Yuan YJ, Li H. Liposomal Bupivacaine for pain control after total knee arthroplasty: a metaanalysis. J Orthop Surg Res 2016;11:84.
11. Yan Z, Chen Z, Ma C. Liposomal bupivacaine versus interscalene nerve block for pain control after shoulder arthroplasty: a meta-analysis. Medicine 2017;96:e7226.
12. Beiranvand S, Eatemadi Ali, Karimi A. New updates pertaining to drug delivery of local anesthetics in particular bupivacaine using lipid nanoparticles. Nanoscale Res Lett 2016;11:307. Available at: https://doi.org/10.1186/s11671-016-1520-8.
13. Klug MJ, Rivey MP, Carter, JT. Comparison of intraoperative periarticular injections versus liposomal bupivacaine as part of a multimodal approach to pain management in total knee arthroplasty. Hosp Pharm 2016;5:305–311.
14. Apseloff G, Onel E, Patou G. Time to onset of analgesia following local infiltration of liposome bupivacaine in healthy volunteers: a randomized, single-blind, sequential cohort, crossover study. Int J Clin Pharmacol Ther 2013;5:367–373.
15. Kenes MT, Leonard MC, Bauer SR, Wyman MJ. Liposomal bupivacaine versus continuous infusion bupivacaine via an elastomeric pump for the treatment of postoperative pain. Am J Health Syst Pharm 2015;72(suppl 3):127–132.
16. Meneghini RM, Bagsby D, Ireland PH, Ziemba-Davis M, Lovro LR. Liposomal bupivacaine injection technique in total knee arthroplasty. J Knee Surg 2017;30:88–96.
17. Lee CY, Robinson DA, Johnson CA Jr, et al. A randomized controlled trial of liposomal bupivacaine parasternal intercostal block for sternotomy. Ann Thoracic Surg 2018;28:1167–1176.
18. Prabhu M, Clapp MA, McQuaid-Hanson E, et al. Liposomal bupivacaine block at the time of cesarean delivery to decrease postoperative pain: a randomized controlled trial. Obstet Gynecol 2018;132:70–78.
19. Perets I, Walsh JP, Mu BH, et al. Intraoperative infiltration of liposomal bupivacaine vs bupivacaine hydrochloride for pain management in primary total hip arthroplasty: a prospective randomized trial. J Arthroplasty 2018;33:441–446.
20. Ma TT, Wang YH, Jiang YF et al. Liposomal bupivacaine versus traditional bupivacaine for pain control after total hip arthroplasty: a meta-analysis. Medicine 2017;96:e7190. Available at: https://doi.org/10.1097/MD.0000000000007190.
21. Cloyd C, Moffetti BS, Bernhandt MB, Evelyn MM, Patel N, Hanson D. Efficacy of liposomal bupivacaine in pediatric patients undergoing spine surgery. Pediatr Anesth 2018;11. Available at: https://doi.org/10.1111/pan.13482.
22. Yu ZX, Yang ZZ, Yao LL. Effectiveness of liposome bupivacaine for postoperative pain control in total knee arthroplasty: a PRISMA-compliant meta-analysis of

randomised controlled trials. Medicine 2018;97:e0171. Available at: https://doi.org/10.1097/MD.0000000000010171.

23. Yeung J, Crisp CC, Mazloomdoost D, Kleeman SD, Pauls RN. Liposomal bupivacaine during robotic colpopexy and posterior repair: a randomized control trial. Obstet Gynecol 2018;131:39–46.
24. DiGiorgi M, Carangelo M, Scranton R. Transversus abdominis plane blocks with single-dose liposomal bupivacaine in conjunction with a nonnarcotic pain regimen help reduce length of stay following abdominally based microsurgical breast reconstruction. Plast Reconstr Surg 2018;142:94e. Available at: https://doi.org/10.1097/PRS.0000000000004480.
25. Malik O, Kaye AD, Kaye A, Belani K, Urman RD. Emerging roles of liposomal bupivacaine in anesthesia practice. J Anaesthesiol Clin Pharmacol 2017;33:151–156.
26. Okoroha KR, Keller RA, Marshall NE, et al. Liposomal bupivacaine versus femoral nerve block for pain control after anterior cruciate ligament reconstruction: a prospective randomized trial. Arthroscopy 2016;32:1838–1845.
27. Pichler L, Poeran J, Zubizarreta N, et al. Liposomal bupivacaine does not reduce inpatient opioid prescription or related complications after knee arthroplasty: a database analysis. Anesthesiology 2018;129:689–699.
28. Cao X, Pan F. Comparison of liposomal bupivacaine infiltration versus interscalene nerve block for pain control in total shoulder arthroplasty: a meta-analysis of randomized control trails. Medicine 2017;96:e8079. Available at: https://doi.org/10.1097/MD.0000000000008079.
29. Rabin T. In brief: FDA approves new use of Exparel for nerve block pain relief following shoulder surgeries. Available at: https://www.fda.gov/NewsEvents/Newsroom/FDAInBrief/ucm604021.htm. Updated April 6, 2018. Accessed November 7, 2018.
30. Nadeau MH, Saraswat A, Vasko A, Elliott JO, Vasco SD. Bupivacaine versus liposomal bupivacaine for postoperative pain control after augmentation mammoplasty: a prospective, randomised, double-blind trial. Anesth Surg J 2016;36:47–52.
31. Richebe P, Brulotte V. CORR Insights®: no difference in early analgesia between liposomal bupivacaine injection and intrathecal morphine after TKA. Clin Orthop Relat Res 2017;475:106–109.
32. McAlvin JB, Padera RF, Shankarappa SA, et al. Multivesicular liposomal bupivacaine at the sciatic nerve. Biomaterials 2014;35:4557–4564.
33. Shapera EA, Rai VK. A content incontinent: report of liposomal bupivacaine induced fecal incontinence. Case Rep Surg 2016;2016:7164983. Available at: https://doi.org/10.1155/2016/7164983.
34. Pinto LM, Pereira R, de Paula E, et al. Influence of liposomal local anesthetics on platelet aggregation in vitro. J Liposome Res 2004;14:51–59.
35. Soberón JR, Sisco-Wise LE, Dunbar RM. Compartment syndrome in a patient treated with perineural liposomal bupivacaine (Exparel). J Clin Anesth 2016;31:1–4.
36. Balocco AL, Van Zundert PGE, Gan SS, Gan TJ, Hadzic A. Extended release bupivacaine formulations for postoperative analgesia: an update. Curr Opin Anaesthesiol 2018;3:636–642.
37. Skolnik A, Gan TJ. New formulations of bupivacaine for the treatment of postoperative pain: liposomal bupivacaine and SABER-bupivacaine. Expert Opin Pharmacother 2014;15:1535–1542.

Time for a New Look at an Old Procedure: Vertebral Augmentation for Painful Compression Fractures as an Option to Restore Function and Quality of Life

Osteoporotic compression fractures affect 30–50% of people older than 50 years.[1] Severe pain that limits basic activities of daily living (ADLs), despite a trial of conservative treatment, is a common reason for patients to be referred to an interventional pain medicine clinic. Vertebral augmentation, which includes both kyphoplasty and vertebroplasty, is an option for patients to help restore function, decrease pain, and decrease mortality.[2]

The key difference between the two procedures is that kyphoplasty involves the use of a balloon to create a cavity and elevate the endplates to help restore vertebral height. The space allows for low pressure injection of viscous cement, which may lower the risk of periosteal leakage.[3]

HISTORY

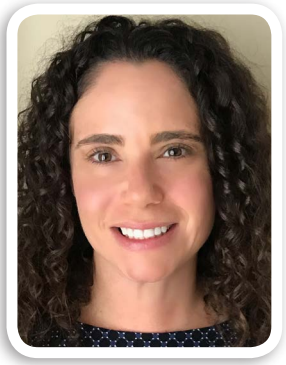
Vertebroplasty was first successfully used clinically in 1984 by Drs Deramond and Galibert, a radiologist and neurosurgeon, respectively, for the treatment of painful cervical hemangioma, and it has been performed in the United States since 1995. Kyphoplasty was approved by the US Food and Drug Administration in 1998 for the treatment of osteoporotic compression fractures.[4] Both are minimally invasive percutaneous procedures that involve the injection of material, most commonly polymethylmethacrylate (PMMA), into the vertebral body. PMMA may offer analgesia via vertebral body solidification, mechanical body stabilization (ie, physical stabilization of the vertebral body fracture by the cement), or inhibition of osteoclastic activity. Temperature elevation may induce neuromodulatory effects on neural structures like the posterior annulus, sinuvertebral nerve, and segmental dorsal root ganglion, which also help to ameliorate pain.[5]

"Most significantly, vertebral augmentation can improve mobility in elderly and frail patient populations, thereby decreasing the risk of atelectasis, deep venous thrombosis, pneumonia, lack of independence, and loss of ability to perform ADLs."

PATIENT SELECTION

Appropriate patients typically experience acute or subacute painful vertebral compression fractures from T5–L5, limiting activities of daily living, despite trials of conservative treatment such as medications, rest, or back braces. Clinically, patients have pain on the spinous process without radicular pain. The gold standard imaging modality is magnetic resonance imaging with short tau inversion recovery sequence demonstrating bone edema at the affected level. Patients who are appropriate candidates for the procedure must be able to stop anticoagulation and be free of active infection.

Contraindications for proceeding with vertebral augmentation include radicular pain with associated retropulsed bone fragment into the spinal canal, an uncorrectable coagulation disorder, active site of infection or sepsis, burst fracture, pain unrelated to fracture, or allergies to PMMA or contrast. Complications are rare but include bleeding, infection, no pain relief, increase in pain, cement leakage, and pulmonary embolism.



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PERFORMING THE PROCEDURE

Vertebral augmentation may be performed with conscious sedation or general anesthesia in an outpatient office setting, surgical center, or hospital. Prep and drape the patient in a sterile fashion. After infiltrating with local anesthetic, use fluoroscopic guidance to advance a trocar via a transpedicular or extrapedicular approach into the vertebral body. Anteroposterior and lateral fluoroscopic images are routinely obtained to ensure proper trocar placement. Once in the vertebral body, take a bone biopsy to evaluate for potential malignancy if indicated. Then, if kyphoplasty is being performed, insert balloons through the trocars bilaterally and inflated to create a cavity to help restore vertebral height. Withdraw the balloons and use PMMA or another bone cement to fill the cavity under live fluoroscopy. Flush needles with local anesthetic and withdraw under live fluoroscopy to ensure cement does not spread posteriorly (Figures 1–11)

The patient is observed for an appropriate amount of time and then discharged. Follow-up visits are typically performed 1 and 4 weeks after the procedure.

CONTROVERSY AND EVIDENCE SUPPORT

Vertebral augmentation was widely accepted as the appropriate treatment for painful vertebral compression fractures unresponsive to conservative treatment prior to 2009.[6,7] That year, however, the *New England Journal of Medicine* published reports of two placebo-controlled, randomized trials that showed no beneficial effect of vertebroplasty compared with paraspinal injection of local anesthetics. Since then, the treatment option has been the

Figure 1: *T12 compression fracture initial anteroposterior view.*

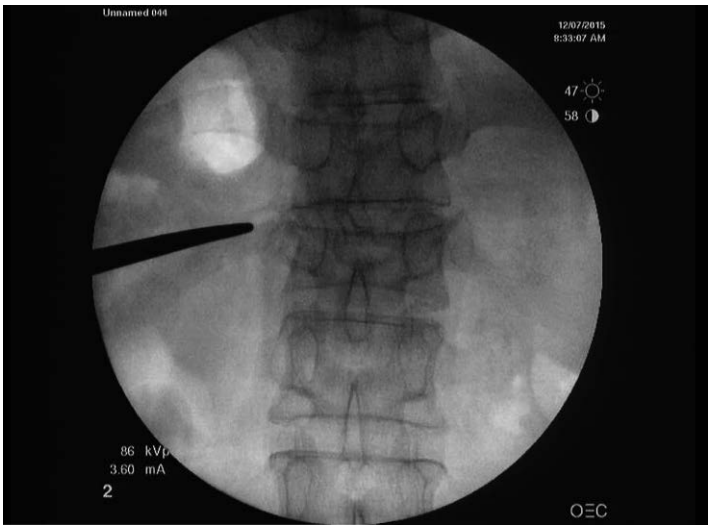


Figure 2: *T12 compression fracture initial lateral view.*

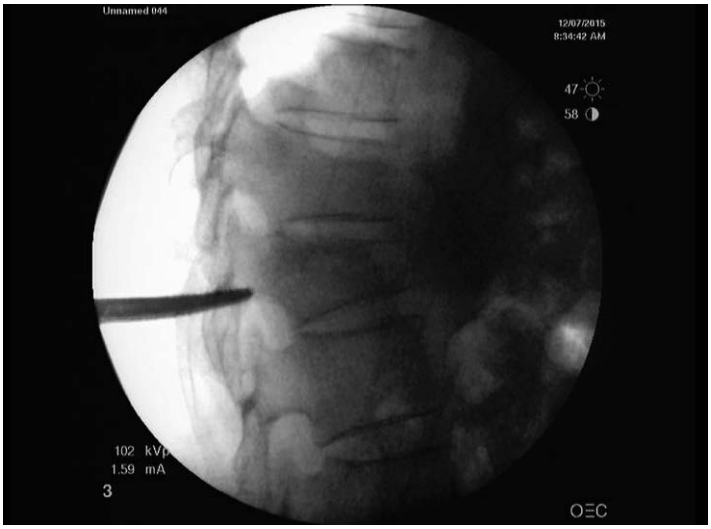


Figure 3: *Trocar mid pedicle anteroposterior view.*

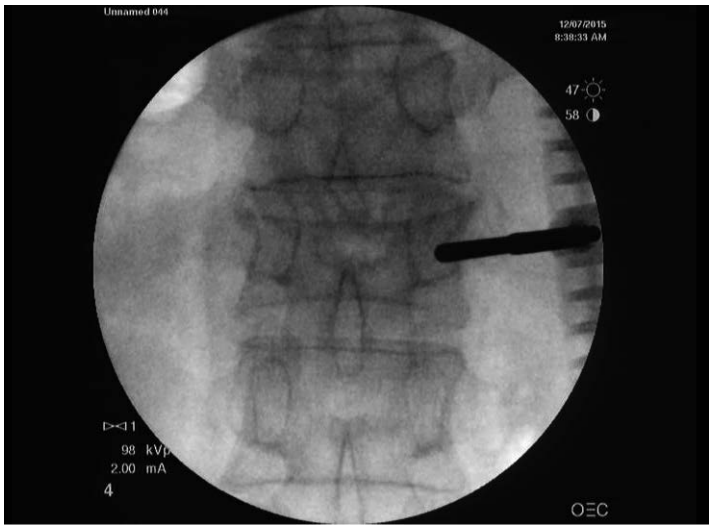
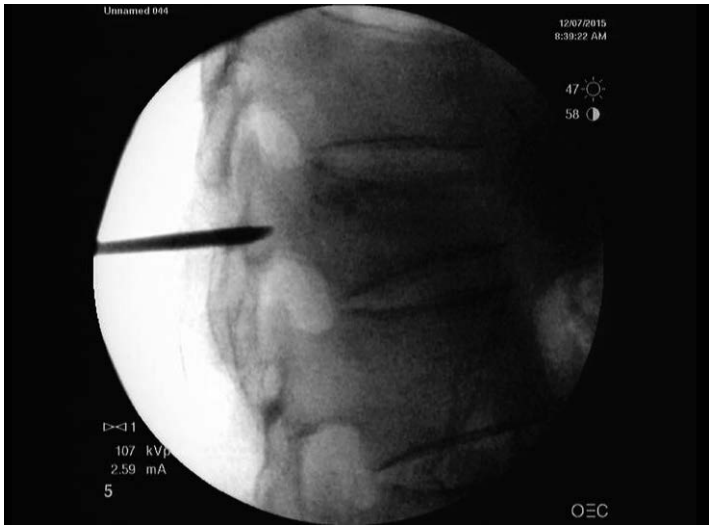


Figure 4: *Trocar mid pedicle lateral view.*



subject of controversy. The studies have since been discredited and downgraded because of design flaws, but the controversy persists despite the publication of six prospective randomized controlled studies and two meta-analyses showing superior results with vertebral augmentation compared to conservative treatment.[8]

In 2018, the EVOLVE trial, a large, prospective clinical study, demonstrated that kyphoplasty is a safe, effective, and durable procedure for the treatment of patients with painful vertebral compression fractures because of osteoporosis and cancer.[9] In addition, researchers conducting another meta-analysis in 2018 endorsed kyphoplasty and vertebroplasty over vertebral augmentation with implant and nonsurgical management for the treatment of vertebral compression fractures. Furthermore, evidence validated the procedure's safety.[10]

PROS/CONS

Vertebral augmentation is not appropriate for all patients. As with any interventional procedure, appropriate patient selection is essential. Patients must fail conservative treatments and continue to have corresponding pain that adversely affects ADLs and quality of life. Patients may fail the use of a back brace because

Figure 5: *Drill in place lateral view.*

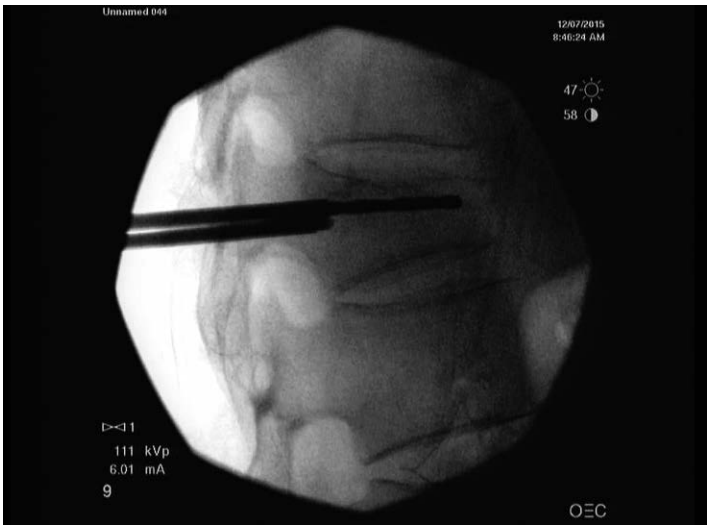


Figure 6: *Drill in place anteroposterior view.*

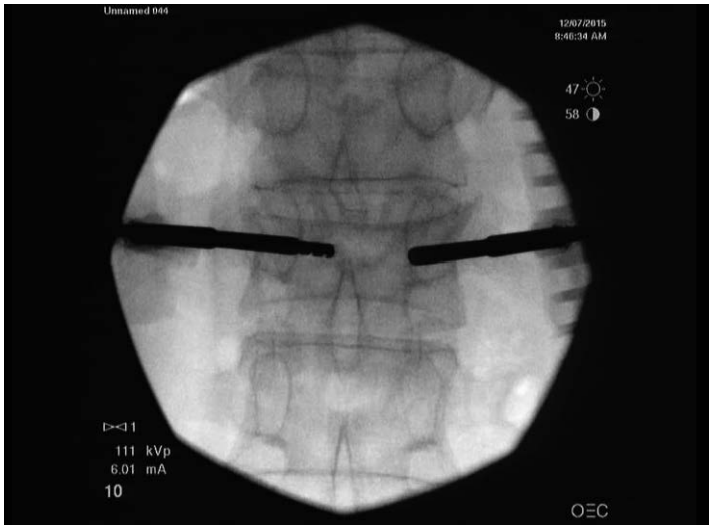


Figure 7: *Balloons in place lateral view.*

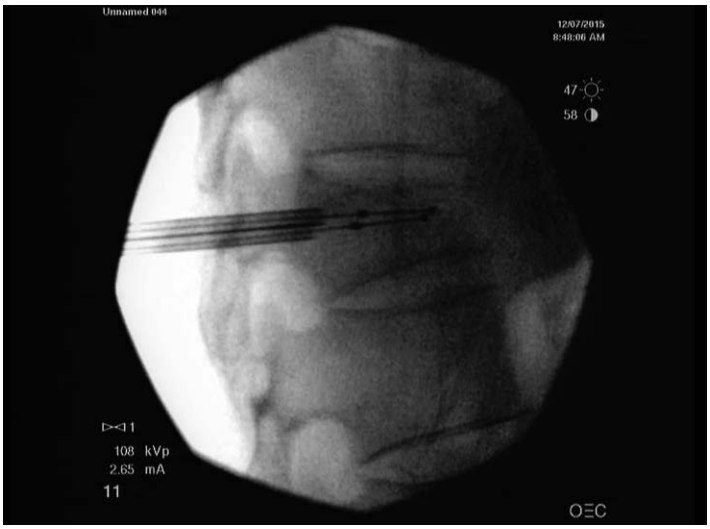
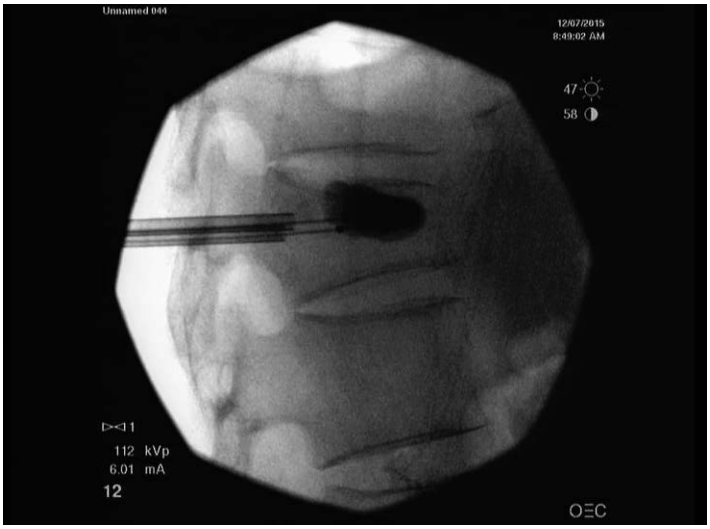


Figure 8: *Balloon inflation lateral view.*



of discomfort or respiratory limitations. They may fail medical management because of side effects. Patients may also not be candidates for certain medications because of comorbid conditions.

Proceeding with a minimally invasive procedure instead of prescribing opioids or other pain medications may result in fewer complications such as dependency, tolerance, respiratory depression, and overdose. Furthermore, polypharmacy in elderly patients can result in additional side effects and increase the risk of subsequent falls. In addition, an increase in kyphosis because of vertebral compression fractures may worsen underlying pulmonary conditions. Most significantly, vertebral augmentation can improve mobility in elderly and frail patient populations, thereby decreasing the risk of atelectasis, deep venous thrombosis, pneumonia, lack of independence, and loss of ability to perform ADLs. As a result, vertebral augmentation has been shown to decrease morbidity and mortality when compared to conservative management in the Medicare population.[2]

Disadvantages of vertebral augmentation include cost as well as complications from the procedure or PMMA. In addition, vertebral augmentation may increase the risk of adjacent level fractures because of biomechanical stress, although this has not been

Figure 9: *Balloon inflation anteroposterior view.*

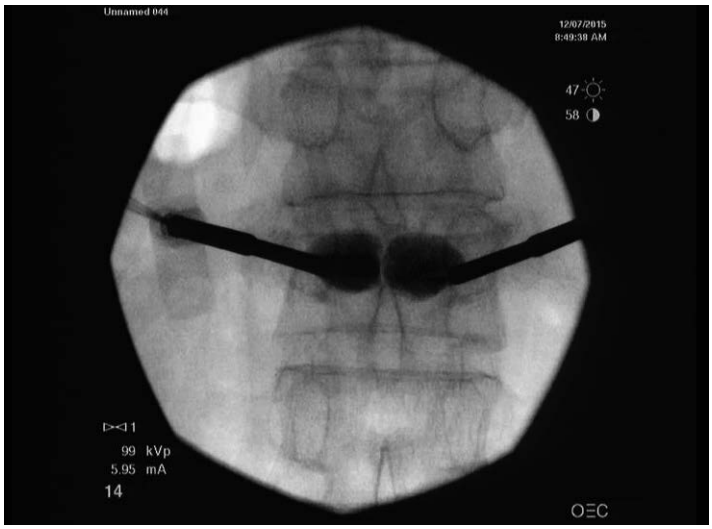
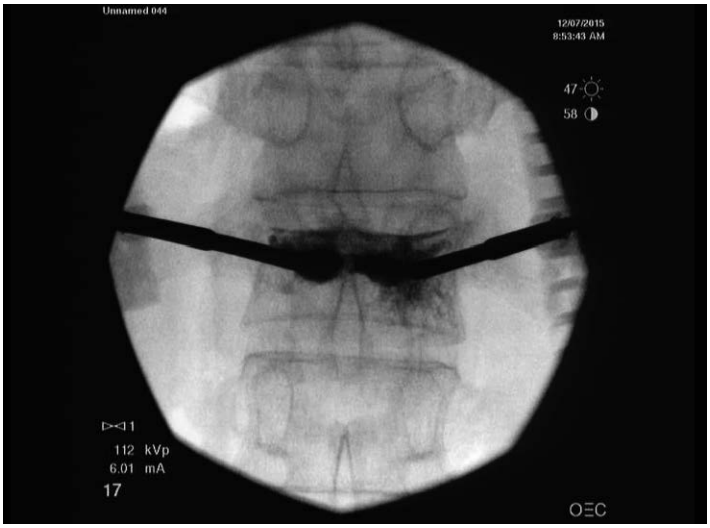


Figure 10: *Cement spread trocars in place anteroposterior view.*

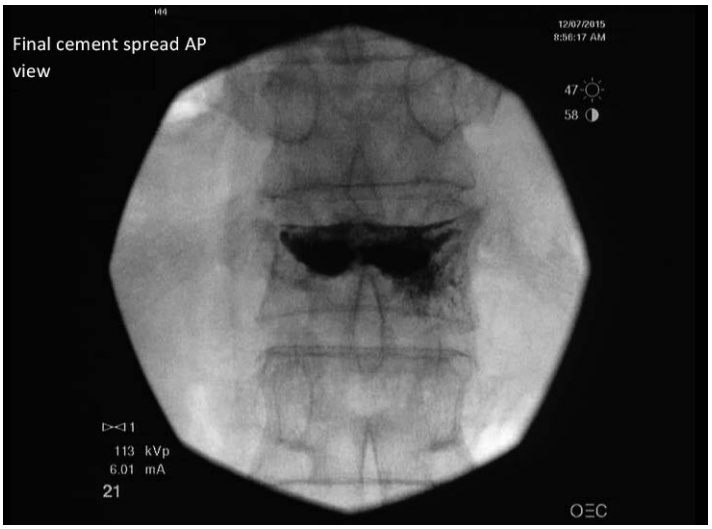


proven. Many patients with one or more vertebral compression fractures may experience additional fractures if the underlying condition, typically osteoporosis, has not been treated.[11]

SUMMARY

As the population continues to age, the number of patients with vertebral compression fractures increases concurrently. Options for treatment include medical management, rest, bracing, vertebral augmentation, and surgery. As with any interventional technique, vertebroplasty or kyphoplasty should be offered by an experienced practitioner only to appropriate patients. With appropriate patient selection, vertebral augmentation provides an effective and low-risk option for patients to resume ADLs and improve quality of life, thereby decreasing morbidity and mortality.

Figure 11: *Final cement spread anteroposterior view.*



REFERENCES

1. Ballane G, Cauley JA, Luckey MM, El-Jajj Fulihan G. Worldwide prevalence and incidence of osteoporotic vertebral fractures. Osteopor Int 2017;28(5):1531–1542.
2. Edidin, AA, Ong K, Lau E, Kurtz S. Morbidity and mortality after vertebral fractures: comparison of vertebral augmentation and nonoperative management in the Medicare population. Spine 2015;40:1228–1241.
3. Hargunai R, Le Corroller T, Khashogii K, Murphy KJ, Munk PL. Percutaneous vertebral augmentation: the status of vertebroplasty and current controversies. Semin Musculskelet Radiol 2011;15:117–124.
4. Garfin SR, Yan HA, Reiley MA. New technologies in spine: kyphoplasty and vertebroplasty for the treatment of painful osteoporotic compression fractures. Spine 2001;26:1511–1515.
5. Armsen N, Boszczyk B. Vertebro-/kypholasty history, development, results. Eur J Trauma 2005;31:433–441.
6. Kallmes DF, Comstock BA, Heagerty PJ, et al. A randomized trial of vertebroplasty for osteoporotic spinal fractures. N Engl J Med 2009;361:569–579.
7. Buchbinder R, Osborne RH, Ebeling PR, et al. A randomized trial of vertebroplasty for painful osteoporotic vertebral fractures. N Engl J Med 2009;361:557–568.
8. Beall D, Tutton SM, Murphy K, Olan W, Warner C, Test JB. Analysis of reporting bias in vertebral augmentation. Pain Physician 2017;20:E1081–E1090.
9. Beall D, Chambers MR, Thomas S, et al. Prospective and multicenter evaluation of outcomes for quality of life and activities of daily living for balloon kyphoplasty in the treatment of vertebral compression fractures: the EVOLVE trial. Neurosurgery 2019;84:169–178.
10. Beall D, Lorio MP, Yun BM, Runa MJ, Ong KL, Warner CB. Review of vertebral augmentation: an updated meta-analysis of the effectiveness. Intl J Spine Surg 2018;12(3):1–27.
11. Berleman U, Ferguson SJ, Nolte LP, et al. Adjacent vertebral failure after vertebroplasty: a biomechanical investigation. J Bone Joint Surg Br 2002;84:748–752.

Regional Anesthesia in Elite Athletes: The Current Evidence and Perspective From the Hospital for Special Surgery

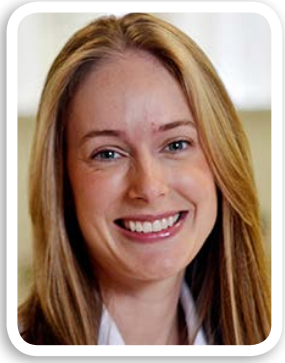
When tailoring an anesthetic plan for orthopedic surgery, multiple factors must be balanced to achieve a good outcome. However, when the patient is a professional athlete, individual risk tolerance for potential side effects and complications of regional anesthesia and analgesia may be very different from those of the general population. The objectives of this article are to review some of the unique considerations that may be of interest to those who are caring for professional athletes (and translatable to other professions who rely on certain physical characteristics to perform their jobs) and to elevate the discussion that is required to gain informed consent.

Caring for a professional athlete is something we frequently face at the Hospital for Special Surgery (HSS) in New York, New York: We saw more than 350 professional athletes in 2018 alone. As a major orthopedic center, we encounter patients from all corners of the world and walks of life. Similar to all patients, athletes' health status, activities of daily living, and goals of surgery must be considered. In addition, we need to assess how the anesthetic and surgery may affect their professional performance when discussing their anesthetic options.

As an analogy, we are frequently asked to make accommodations for patients undergoing general anesthesia who use their voices professionally, such as operatic singers. Here, we may choose a laryngeal mask airway or smaller endotracheal tube with or without the aid of video laryngoscopes to protect the vocal structures. I look at caring for professional athletes, or others who depend on physical skills for their livelihood, in much the same way. Because we perform regional anesthesia for most of our cases at HSS, this is something not to be taken lightly.

We know from prior studies that regional anesthesia, including peripheral nerve blocks (PNBs) and neuraxial techniques, is not without risk. Although ultrasound has made regional anesthesia more accessible, it has not eliminated some of those risks. However, the *Second ASRA Evidence-Based Medicine Assessment of Ultrasound-Guided Regional Anesthesia Executive Summary* does support the use of ultrasound to decrease the incidence of local anesthetic toxicity (LAST) and the incidence and intensity of hemidiphragmatic paresis (HDP).[1]

Minimizing HDP is a common goal when performing brachial plexus or upper-extremity PNBs. Interscalene blocks have a 100% incidence of HDP; supraclavicular blocks typically have a 50% incidence.[2] Although those side effects rarely last longer than the duration of the block, persistent paresis for more than a few months has occurred in patients who have had an interscalene block performed with a peripheral nerve stimulator.[2] Most patients would not necessarily be bothered by persistent HDP. However, it may render a marathon runner unable to compete and represents an unacceptable risk to assume in that patient population. Whether ultrasound guidance contributes to decreasing persistent phrenic nerve paralysis is unclear, but the complication could be problematic for some professional athletes and is worth considering in the same way we may avoid the risk of HDP in patients with advanced pulmonary disease.



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Despite ultrasound guidance decreasing the incidence of LAST and HDP, the ASRA summary reported a lack of evidence for ultrasound decreasing the incidence of postoperative neurologic symptoms (PONS).[1] PONS is perhaps the most complex and least predictable complication of regional anesthesia. We know from prior studies that the incidence of temporary (resolving in less than 6 months) PONS, such as paresthesia, can be as high as 19%. Permanent PONS can occur in as many as 5 in 10,000 patients (0.05%).[3] When compared with the global benefits of regional anesthesia and analgesia for orthopedic surgery (including lower rates of thromboembolic events, infection, and pulmonary and renal complications), the low risk of PONS is usually well worth assuming for the general population—specifically because the majority of PONS cases resolve quickly and the chance of permanent injury is low. However, for professional athletes, any incidence may be too high, depending on whether and how their livelihood will be affected.

"To a professional athlete or concert violinist, even the smallest of deficits may cause anxiety during recovery. A more permanent deficit may lead to a decrease in performance or an inability to perform their job and hence lose their livelihood."

Blocks are rarely performed in a bubble without the companionship of a surgery. Given the low incidence of permanent PONS, designing a study to quantify the incidence of PONS after PNB

without surgery in volunteers would be challenging and ethically questionable. However, we can look at the surgical literature to gain an understanding of the incidence of PONS for sports surgery conducted under general anesthesia.

When choosing to perform a PNB on a patient, especially a professional athlete, it is crucial to understand the inherent risks of the surgery itself in relation to PONS. Anterior cruciate ligament (ACL) reconstructions performed with hamstring autografts have become more common in recent years. We often use adductor canal blocks for postoperative analgesia in many ACL reconstructions. A systematic review of patellar tendon grafts versus hamstring autografts confirmed that surgical complication rates from ACL reconstruction could be significant.[4] The review noted that the incidence of damage to the saphenous nerve and nerve branches could be as high as 88% depending on the approach of the incision.[5] When the incisional approach was taken into consideration, the incidence was as low as 14.9%.[6] A saphenous nerve injury may be inconsequential to some patients, given that it is solely a sensory nerve. However, at the other extreme, a permanent injury causing complex regional pain syndrome could be very detrimental to patients.

Other surgeries are also associated with PONS when performed under general anesthesia. Shoulder surgery is one of the higher risk surgeries for neurologic complications. In typical sports procedures, injuries to the brachial plexus are seen in 1% to 2% of rotator cuff surgeries and 1% to 8% of anterior instability surgeries; this increases to 3% for shoulder replacements and 2% to 4% for reverse shoulder replacements.[7] The Latarjet procedure, typically performed for shoulder instability, is associated with even higher rates of PONS. In a study of 34 patients undergoing a Latarjet procedure under total intravenous anesthetic, 20.6% of patients had a clinically detectable nerve deficit after surgery. Interestingly, intraoperative neuromonitoring, comprising somatosensory evoked potentials and transcranial motor evoked potentials, was used in the study; in 76.5% of cases, an "alert" for nerve injury was recorded, followed by alteration in surgical and anesthetic conditions to restore baseline nerve signals.[8]

Patients undergoing ulnar collateral ligament (UCL) reconstruction at the elbow (which is common to baseball pitchers and known colloquially as "Tommy John" surgery) by nature of the injury have a high risk of postoperative ulnar neuropathy. A systematic review of UCL surgeries found that the incidence of ulnar neuropathy was as high as 12%, with some of those patients additionally having an ulnar nerve transposition at the time of the original surgery.[9]

As anesthesiologists, we are asked to look at the big picture, taking into account the surgery, the patient's medical history, and socioeconomic factors. As regional anesthesiologists, we must additionally consider how complications of our blocks and the surgery may affect patients on a long-term basis. Although the incidence of complications from PNBs appears to be low, it may not be low enough for certain patient populations. Many people may not mind or even notice a small sensory deficit postoperatively as they recover. But to a professional athlete or concert violinist, even the smallest of deficits may cause anxiety during recovery. A more permanent deficit may lead to a decrease in performance or an inability to perform their job and hence loss of their livelihood. This is not to say that regional anesthesia is not without benefit for most patients: We perform tens of thousands of regional anesthetics a year, and our patients greatly benefit from them.

We are fortunate to have surgical colleagues who not only support the use of regional anesthesia but also request it for most of their patients. Although our surgeons have anesthetic preferences, they trust that we will make the right decision for patients in terms of risk versus benefit of a regional technique, even in a professional athlete. On occasion, our surgeons, who are worried about their own complications, will ask us not to perform a PNB so that they are able to assess neurologic function postoperatively.

We have open and honest discussions with all of our patients regarding the potential risks and benefits and what that may mean for their recovery and future. Many professional athletes have been coached from their trainers, team physicians, and agents to be extremely risk adverse and therefore elect to have a general anesthetic or simply a neuraxial technique, not wishing to gamble on the extraordinarily rare complications from PNBs. It is important to remember that this does not prevent all risk of PONS, and we emphasize this to them as well. Even patients undergoing general anesthesia for shoulder surgery, for example, need to have special attention given to positioning of the head and neck, given that they are often in a beach chair position with their head in a fixed position during surgery. The potential contribution of surgical complications cannot be ignored, although our surgical colleagues are better suited to address that conversation with patients. Having a command of surgical risks in addition to anesthetic complications, either regional or general, and discussing this in depth with your patients are the most important aspects of caring for anyone—especially a professional athlete having orthopedic surgery.

REFERENCES

1. Neal JM, Brull R, Horn JL, et al. The second American Society of Regional Anesthesia and Pain Medicine evidence-based medicine assessment of ultrasound-guided regional anesthesia: executive summary. Reg Anesth Pain Med 2016;41(2):181–194.
2. Pakala SR, Beckman JD, Lyman S, Zayas VM. Cervical spine disease is a risk factor for persistent phrenic nerve paresis following interscalene nerve block. Reg Anesth Pain Med 2013;38(3):239–242.

3. Neal JM. Ultrasound-guided regional anesthesia and patient safety: update of an evidence-based analysis. Reg Anesth Pain Med 2016;41(2):195–204.
4. Hardy A, Casabianca L, Andrieu K, Baverel L, Noailles T. Complications following harvesting of patellar tendon or hamstring tendon grafts for anterior cruciate ligament reconstruction: systematic review of literature. Orthop Traumatol Surg Res 2017;103(8S):S245–S248.
5. Kjaergaard J, Fauno LZ, Fauno P. Sensibility loss after ACL reconstruction with hamstring graft. Int J Sports Med 2008;29:507–511.
6. Wilson TJ, Lubowitz JH. Minimally invasive posterior hamstring harvest. Arthrosc Tech 2013;2:e299–e301.
7. Kam AW, Lam PH, Haen PSWA, Tan M, Shamsudin A, Murrell GAC. Preventing brachial plexus injury during shoulder surgery: a real-time cadaveric study. J Shoulder Elbow Surg 2018;27(5):912–922.
8. Delaney RA, Freehill MT, Janfaza DR, Vlassakov KV, Higgins LD, Warner JJ. 2014 Neer award paper: neuromonitoring the Latarjet procedure. J Shoulder Elbow Surg 2014;23(10):1473–1480.
9. Clain JB, Vitale MA, Ahmad CS, Ruchelsman DE. Ulnar nerve complications after ulnar collateral ligament reconstruction of the elbow: a systematic review. Am J Sports Med 2018:363546518765139.

Bacterial Infection Reports Following Contaminated Umbilical Cord Product Injections

The Centers for Disease Control and Prevention (CDC) recently released a report detailing serious infectious adverse events after injection of non–Food and Drug Administration (FDA)–approved stem cell products derived from umbilical cord blood. The report contains complication information on 12 patients in Texas (seven), Florida (four), and Arizona (one). Stem cell products derived from umbilical cord blood are FDA approved only for hematopoietic and immunologic reconstitution.[1] The products in the CDC report, however, were used for non–FDA-approved conditions, such as osteoarthritis and pain, in orthopedic clinics, pain clinics, spine treatment clinics, and ambulatory surgery centers. The complications included bloodstream infections, joint infections, and epidural abscesses. All of the patients required hospitalization for 4 to 35 days, but no deaths were reported.[2] All 12 patients had received products processed by Genetech, Inc., and distributed by Liveyon, LLC.

Five different organisms were isolated from the patients, including *Escherichia coli*, *Enterococcus faecalis*, *Proteus mirabilis*, *Citrobacter koseri*, and *Citrobacter freundii*. Secondary to bacteria being found in unopened vials from clinics in Florida and Texas, investigators suggested it is less likely that the contamination occurred at the involved clinics. The CDC, therefore, reported that the contamination likely occurred prior to distribution.[3] Furthermore, the tested unopened vials demonstrated contamination with similar organisms. They also found that all six of the unopened vials tested in Texas came from the same cord-blood donor and had the same processing date as the vials that had been used in the patients who developed infections. (The seventh affected Texas patient received cells from a different donor.) Four other unopened vials tested in Florida were found to have different donors and processing dates than the vials in Texas. Two of the four vials came from the same donor and had the same processing date. Of those two vials, one was found to contain *E. coli*. The remaining two vials had different donors and different processing dates. One of those vials was found to be contaminated with *E. coli* and *E. faecalis*.[2]

No validated process for sterilization currently exists, so the manufacture of stem cell products derived from umbilical cord blood needs to be strictly controlled.[4] The Genetech-manufactured, Liveyon-distributed product is registered only with the FDA and is not approved by the FDA. Companies often market their products as FDA registered, but this is not the same as an FDA-approved product. Many patients, as well as some providers, are unlikely to know this distinction, which may lead some to believe that the products have undergone an extensive FDA review process and obtained official FDA approval when, in fact, FDA-registered products are not subject to the same rigorous investigations.

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Currently, several companies, clinics, and providers advertise stem cell treatments for non–FDA-approved indications for which no reliable or only weak evidence of efficacy or safety exist. The treatments are often not performed under standard-of-care infection control conditions, further increasing the risk of complication.[5]

"No validated process for sterilization currently exists, so the manufacture of stem cell products derived from umbilical cord blood needs to be strictly controlled. Companies often market their products as FDA registered, but this is not the same as an FDA-approved product."

The recent CDC report demonstrates the potential risk of non–FDA-approved stem cell treatments.[3] Per FDA recommendations, patients should avoid receiving these products outside of controlled clinical trials under an investigational new drug application.[1] Any adverse events associated with the Genetech/Liveyon products or any unapproved stem cell therapies need to be reported to FDA's MedWatch Safety Information and Adverse Event Reporting Program. The ASRA Regenerative Medicine Interest Group is committed to continuing to inform our members of adverse events associated with regenerative medicine applications to pain medicine.

REFERENCES

1. Guh AY, Thompson ND, Schaefer MK, Patel PR, Perz JF. Patient notification for bloodborne pathogen testing due to unsafe injection practices in the US health care settings, 2001–2011. Med Care 2012;50:785–791.
2. Perkins KM, Spoto S, Rankin DA, et al. Notes from the field: infections after receipt of bacterially contaminated umbilical cord blood–derived stem cell

products for other than hematopoietic or immunologic reconstitution—United States, 2018. MMWR Morb Mortal Wkly Rep 2018;67:1397–1399.

3. Food and Drug Administration. FDA warns about stem cell therapies. 2017. Available at: https://www.fda.gov/ForConsumers/ConsumerUpdates/ucm286155.htm. Accessed March 1, 2019.
4. Marks PW, Witten CM, Califf RM. Clarifying stem-cell therapy's benefits and risks. N Engl J Med 2017;376:1007–1009.
5. Food and Drug Administration. Guidance for industry: biologics license applications for minimally manipulated, unrelated allogeneic placental/umbilical cord blood intended for hematopoietic and immunologic reconstitution in patients with disorders affecting the hematopoietic system. Available at: https://www.fda.gov/downloads/biologicsbloodvaccines/guidancecomplianceregulatoryinformation/guidances/cellularandgenetherapy/ucm357135.pdf. Accessed March 1, 2019.

What a Difference a Block Makes: A Perspective From the United States on Setting up a Regional Anesthesia Service

The health care industry in the United States is facing many challenges. As health care systems grow, individual providers are often expected to provide extensive and complex care with decreasing returns. Finding ways to improve patient outcomes and satisfaction while maintaining positive revenue is becoming increasingly important.

Interest in regional anesthesia has come and gone over the years. Recently, evidence has been increasing regarding the benefits of a well-run comprehensive pain management program that contains a strong regional anesthesia component. Benefits include improved patient outcomes (decreased pain levels, improved mobility, decreased incidence of complications) as well as financial savings (reduced length of stay and improved patient satisfaction).[1–5] To accomplish those goals, providers must build a program that can meet the specific institutional needs.

NEEDS ANALYSIS

The first step in building a regional anesthesia program is to determine what types of surgeries or procedures would benefit from a regional block at your institution. Then, analyze the data, including length of stay, pain levels during admission, patient satisfaction scores, and cost per case, depending on how data are collected at your institution.

Compare the current length of stay at your institution with local or national averages to determine how aggressive the changes need to be to meet service expectations. Once a cost per day for a case or diagnosis is established, multiply it by the projected decrease in length of stay to find the approximate cost savings that could be accomplished by implementing a standardized approach to patient care involving regional anesthesia.

"Benefits include improved patient outcomes (decreased pain levels, improved mobility, decreased incidence of complications) as well as financial savings (reduced length of stay and improved patient satisfaction)."

As pain control improves, patient satisfaction is also expected to improve. Quality metrics often have reimbursement components attached, hence the financial incentive for a comprehensive approach to pain management.

Establishing a baseline of financial and quality metrics is critical to future program evaluation to garner support and measure the success after implementation.

PUTTING THE PIECES TOGETHER

Several moving parts must be coordinated to bring a regional anesthesia program to life. An administrative sponsor is needed to make decisions regarding financial support for a regional anesthesia program and to assist with completing the financial and quality analysis to guide the initial phases of program development.

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Key clinical and administrative stakeholders—including leaders from anesthesia, surgery, perioperative, and nursing departments—should be identified and brought together to determine the desired outcomes and what it will take to achieve them. Individual surgical service line leaders may also be needed once a framework has been established so they can see the impact on their patients and provide input regarding any concerns they may have.

CLINICAL BACKGROUND

The anesthesiology group is the obvious first stop on the path to creating a regional anesthesia service. Know what services your anesthesia group can provide, and review the contract for provision of services to see if it specifically includes an expectation to perform regional blocks when appropriate or needed. If anesthesiologists currently on staff are not comfortable with performing the necessary blocks, provide additional training and ensure that new providers have a level of comfort with regional anesthesia as part of the job requirement.

Evaluate the work environment in terms of space to do blocks in the preoperative holding or postanesthesia care unit. Additional support staff may be needed to assist with performing the blocks. Identify necessary equipment for the blocks and ensure it is made available.

Clinical coverage for follow-up care will depend on patient volumes and clinical complexity. Certified registered nurse anesthetists can assist with postoperative regional anesthesia management. If nonregional anesthesia pain management services are needed at your institution, creating a more comprehensive acute pain service may be in the best interest of patients and the institution.

When the program is ready to launch, provide training for nursing staff on units where patients will be sent. This training should include the basics of anatomy and pathophysiology of the regional blocks, pharmacology of the medications used for the blocks, and use of equipment for continuous infusions (eg, pumps).

BARRIERS TO CONSIDER

Several groups must come together to establish specific protocols for a regional anesthesia program. For example, a hip fracture protocol may include a femoral or fascia iliaca block or catheter for pain control and involve emergency department physicians, hospitalists, orthopedic surgeons, anesthesiologists, and perioperative services. Consider each service's budget, staff, and site of service constraints. Setting up timelines and communication strategies will ensure that all services are provided in a timely manner.

The balance of clinical needs and expense will require extensive discussions with hospital administration, because the initial need can be a significant investment. Convincing an institution that the cost of the program is worthwhile may be difficult because the initial revenue may not offset the cost. Thus, highlight the improvement in patient outcomes and cost savings from reductions in hospital length of stay because those will more than cover any initial expenses related to establishing and maintaining the program. The process can take several months, so prepare as much of the background work in advance to demonstrate the overall long-term benefits of a strong regional anesthesia program before initial meetings with stakeholders.

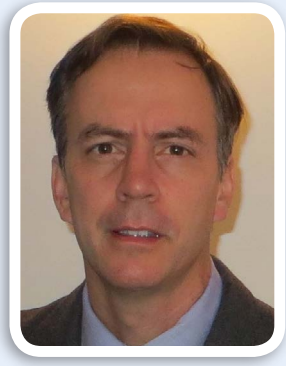
CONCLUSION

Significant amounts of work will go into data collection and calculations to create a case for developing a regional anesthesia program. All involved parties need to commit to collaborate and develop a program that runs smoothly. Ensure that the health care system understands that without appropriate incentives (eg, call pay, stipends), maintaining the level of quality to achieve the desired benefits may not be possible. Focus on providing patients with the best possible care to reach all of the benefits of a strong regional anesthesia program.

REFERENCES

1. McIsaac DI, McCartney CJ, Walraven CV. Peripheral nerve blockade for primary total knee arthroplasty: a population-based cohort study of outcomes and resource utilization. Anesthesiology 2017;126:213–320.
2. Parikh RP, Sharma K, Guffey R, Myckatyn TM. Preoperative paravertebral block improves postoperative pain control and reduces hospital length of stay in patients undergoing autologous breast reconstruction after mastectomy for breast cancer. Ann Surg Oncol 2016;23:4262–4269.
3. Morrison RS, Dickman E, Hwang U, et al. Regional nerve blocks improve pain and functional outcomes in hip fracture: a randomized controlled trial. J Am Geriatric Soc 2016;64:2433–2439.
4. Mistry JB, Chughtai M, Elmallah RK, et al. What influences how patients rate their hospital after total hip arthroplasty? J Arthroplasty 2016;31:2422–2425.
5. Etier BE Jr, Orr SP, Antonetti J, Thomas SB, Theiss SM. Factors impacting Press Ganey patient satisfaction scores in orthopedic surgery spine clinic. Spine J 2016;16:1285–1289.

How to Build a Block Room: A Canadian Perspective



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The "block room"—a dedicated space outside of operating theaters for performing regional anesthesia—has no established history of inception. One of its earliest official descriptions, some 34 years ago, came as a result of a then-"alarming" dearth in regional anesthesia education.[1] With the rapid growth of ultrasound-guided regional anesthesia in the past decade, many centers have established a block room setup to promote efficiency, education, research, and patient experience when performing regional anesthesia.

EFFICIENCY BENEFITS OF A BLOCK ROOM MODEL

One of the biggest barriers to providing regional anesthesia is time. Without a block room setup, nerve blocks are most commonly performed in operating rooms (ORs) prior to commencement of the surgery. Any increase in nonoperative time is considered inefficient.

A block room overcomes that issue by allowing for a parallel-processing concept (see Figure 1). With two physical spaces dedicated for one surgeon's list (the OR and the block room), anesthetic procedures for a subsequent patient can occur while the first patient is undergoing surgery. By the time the first patient leaves the OR, most (unless the patient is also undergoing general anesthesia) of the anesthesia-related procedures would have been completed in the block room, thus minimizing or eliminating anesthesia-related time spent in the OR.

Parallel processing with the use of a block room has been shown to reduce preprocedure OR time in upper-extremity surgeries by 21 minutes[2] or the median turnover time from 54 to 15 minutes (Sunnybrook Health Sciences Centre, Department of Anaesthesia, unpublished data, 2005). Similarly, the introduction of a block room reduced anesthetic preparation time by 19 minutes when thoracic epidural anesthesia was employed.[2] The institution of a block room in an orthopedic hospital in Toronto performing lower-extremity arthroplasties reduced the overall OR time (including turnover time) by 18% and allowed for an extra case per room per day (Sunnybrook Health Sciences Centre, Department of Anaesthesia, unpublished data, 2005). Another hospital in the United Kingdom was performing 25 blocks a week in the OR, and by instituting a block room, it reduced anesthetic time to allow for an average of one extra case per day.[3] However, depending on the case load and type of procedures, the efficiency benefit of a block room may not always offset the costs involved.

"Parallel processing with the use of a block room has been shown to reduce preprocedure OR time in upper-extremity surgeries by 21 minutes or the median turnover time from 54 to 15 minutes."

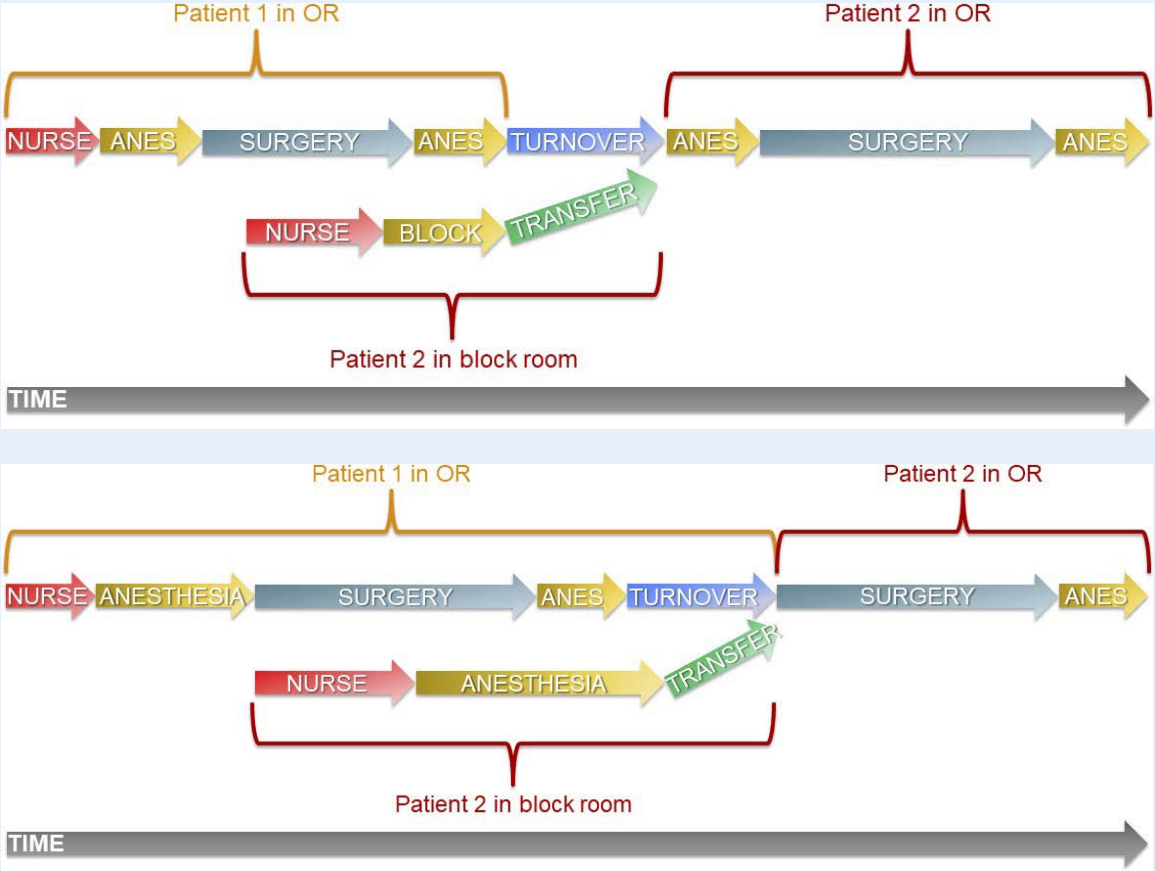
COST BENEFITS OF A BLOCK ROOM MODEL

Studies have estimated that the cost of OR time ranges from $36 to $62 per minute but that reducing OR time alone would not greatly reduce the overall cost of an operation, per se, because of other indirect costs.[4,5] However, other cost reductions include recovery room stay, hospital stay, and whether a regional technique reduces the likelihood of an intensive care unit admission. Of course, setting up a block room has additional initiation costs such as materials, the need for additional ancillary personnel, and extra space. Prior to making a business case, perform a cost-benefit calculation with hospital administration or accounting that considers the hospital case load and type and the availability of regional anesthesia–trained anesthesiologists.

EDUCATION BENEFITS OF A BLOCK ROOM MODEL

Block rooms allow for a central area where all regional anesthesia activities and personnel congregate. Experts can impart their knowledge on larger numbers of trainees who will potentially be involved in a higher number of regional procedures.[6,7] This is obviously beneficial in academic health centers with anesthesia residents and fellows and may promote research activities. Even in nonteaching institutions, a block room setup can facilitate continued medical education for anesthesiologists looking to improve their regional anesthesia skills.

Figure 1: *(a) Parallel processing for patients who have both regional and general anesthesia. (b) Parallel processing for patients who have only surgical nerve block.*



Teaching may be more effective in an arena with diminished time pressure that offers more opportunity for learners to participate while encouraging new ideas and techniques.[1,2]

PATIENT BENEFITS OF A BLOCK ROOM MODEL

In our experience, the number of nerve blocks performed has increased since the introduction of a block room. For example, our successful thoracic epidural insertion rate has increased by 26%. The ability to offer more regional blocks when indicated can lead to improved perioperative outcomes such as reduced recovery room and hospital length of stay and fewer readmissions.[8]

A block room can also provide a better patient experience during the actual regional block procedure. When patients enter an OR, they encounter myriad surgical equipment and multiple personnel preparing for surgery. Such an environment provides little privacy and may lead to increased patient anxiety. During a block room trial at one of our institutions, patients were surveyed about their experience in the block room. Compared with baseline, patients reported better preprocedure explanations with the block room model as well as better satisfaction overall.[4]

Furthermore, the block room has the potential to be a significant part of the anesthetic perioperative care model. If we reimagine the block room as an assessment and preoperative care unit, it can become much more than a place for regional anesthesia. An adequately equipped block room with appropriately trained staff can be used to perform all kinds of anesthesia procedures, such as point-of-care ultrasound assessments for semiurgent patients, potentially altering management and postoperative care plans.

An anecdote from our block room is worth considering. A patient scheduled for ankle surgery complained of calf pain in the block room, and a bedside ultrasound of the popliteal vein and femoral veins found a deep vein thrombosis. The diagnosis may have happened without a block room, yet it illustrates the potential for a block room to go beyond nerves and needles.

FROM PLANNING TO IMPLEMENTATION: THE LOGISTICS OF SETTING UP A BLOCK ROOM

Because of institutional differences, block room setups are not easily directly transferred from one hospital to another without modifications. To establish a block room setup that fits your local needs, we suggest that a quality improvement project be conducted using the Plan-Do-Study-Act Model as a guide.[5]

We recently set up a second block room in the main site of one of our institutions. This site treats a large trauma and oncology population. With the support of hospital administration and nursing teams, we set up a two-bay block room using existing OR infrastructure, labor resources, and equipment. The block room was sited in a part of the recovery room that was not being used but had monitors, oxygen supply, and suction. We used a set of portable shelves to house the equipment and the ultrasounds that were already part of the OR pool. We staffed the block room with an anesthesia fellow and a consultant (as the block room coordinator) from the OR who was booked with a senior trainee. Although we do rotate residents through our block room, the trainee is not booked on a regional rotation, which allows the coordinator some latitude in movement on busy days. Ancillary staff consists of a circulating nurse from the patient's OR to check the patient when he or she arrives and an anesthesia assistant who floats between the ORs and the block room. The setup resulted in very little real cost to the hospital because most of the process just required shifting existing materials and labor. The detailed components of a successful block room are further illustrated in Figure 2.

Every day, the block room coordinator evaluates the following day's list and selects suitable patients for the block room. Block room service time starts 60 minutes prior to the actual OR start time for the first case. For subsequent cases, the block room coordinator liaises with various ORs and checks the urgent list for any block candidates. Although the process is labor intensive, it allows for additional patients to be brought into the block room well in advance of their procedure and complete the block with very little time pressure.

During a trial period, we started a block room database using a simple electronic spreadsheet that identified each procedure, time spent in the room, time spent doing the actual block, and the time the patient went to the OR. During down time between blocks, the staff anesthetist or fellow enters the data into the computer from the block room sheet that anesthesia assistants complete for each procedure. However, the hospital created a patient-tracking system for all the ORs that also serves as a database. We will be switching to this system because it automatically creates a patient encounter, can be completed using drop-down menus, and will follow patients longitudinally throughout their hospital stay.

Figure 2: *Components of a successful block room.*

Need

- Patients and surgeries that would benefit from regional anesthesia

Providers

- Physicians with regional anesthesia training
- Administrative means to advocate and support block room

Infrastructure

- Block room space with:
  - Equipment and drugs for regional nerve blocks
  - Appropriate resources such as oxygen, suction and monitoring
  - Access to resuscitative equipment
  - Close proximity to operating room (and preferably recovery)

Support

- Essential to have support from:
  - Hospital administration
  - Anesthesia colleagues
  - Certified registered nurse anesthetists or anesthesia assistants
  - Nursing (operating room, recovery, ward)
  - Surgery
  - Patient transport support
- Liaise with each group to make them aware and part of block room logistics

Data

- Provide data to follow and record block room activities for further improvement of block room and to demonstrate the benefits of block room to solidify the business case

In the pilot project's first month, we had more than 70 patients in our block room and reduced OR time by 15–20 minutes per patient, a positive impact because our hospital has been dealing with significant labor costs related to overtime. In some cases, patients would not have received a block if a designated block room did not exist, and that time savings would not apply. However, our group contended that the length of stay in recovery would be reduced or eliminated with the increased number of regional techniques performed, which has the potential to affect patient flow and ultimately decrease hospital costs. With these data, hospital management realized that the benefits of a block room justified the added costs and agreed to fund an anesthesia assistant position for 5 working days per week.

CONCLUSION

Block rooms have many benefits in terms of patient quality of care, health care education, efficiency, and potentially cost savings for hospitals. Because they may not be useful in every hospital setting, a careful assessment of the cost-benefit ratio should be carried out before initiation. The design and implementation of an institution-specific block room setup should be multidisciplinary and data continuously collected to confirm the proposed benefits and refine the setup over time.

REFERENCES

1. Rosenblatt RM, Shal R. The design and function of a regional anesthesia block room. Reg Anesth 1984;9:12–16.
2. Gleicher Y, Singer O, Choi S, McHardy P. Thoracic epidural placement in a preoperative block area improves operating room efficiency and decreases epidural failure rate. Reg Anesth Pain Med 2017;42:649–651.
3. Chazapis M, Kaur N, Kamming D. Improving the peri-operative care of patients by instituting a 'block room' for regional anaesthesia. BMJ Open Qual 2014;3:u204061.w1769.
4. Crnic A, McCartney CM, McConnell M, Wong PB. A procedure room for regional and neuraxial anesthesia: effects on OR efficiency and patient satisfaction [abstract A2086]. Presented at: Anesthesiology Annual Meeting; October 2017; Boston, MA.
5. Berwick DM. A primer on leading the improvement of systems. BMJ 1996;312:619–622.
6. Martin G, Lineberger CK, MacLeod DB, et al. A new teaching model for resident training in regional anesthesia. Anesth Analg 2002;95:1423–1427.
7. Richman JM, Stearns JD, Rowlingson AJ, Wu CL, McFarland EG. The introduction of a regional anesthesia rotation: effect on resident education and operating room efficiency. J Clin Anesth 2006;18:240–241.
8. Liu SS, Strodtbeck WM, Richman JM, Wu CL. A comparison of regional versus general anesthesia for ambulatory anesthesia: a meta-analysis of randomized controlled trials. Anesth Analg 2005;101:1634–1642.

PRO Novel Block Techniques Should Be Taught During Anesthesiology Residency

I can easily recall an experience I had during the first week of my regional anesthesia second-year rotation. I was preparing ropivacaine for the first few cases of the day when the attending anesthesiologist said, "Let's do an adductor canal block [ACB] instead of a femoral block for the patient scheduled for knee arthroplasty today." I was excited for the novelty of the procedure because ACB had first been described in the literature only 4 years prior. However, ACBs were not routinely practiced at my institution yet, and I felt nervous because I lacked experience with the procedure. Nevertheless, we performed the block effectively, and the patient had satisfactory analgesia with the expected outcome of little noticeable leg weakness. I felt thrilled that I had learned a new technique that had the potential to be the future standard of analgesia for total knee arthroplasties. Unfortunately, I had few additional opportunities to practice ACBs during my residency training, and my proficiency at performing them developed not during residency but in fellowship.

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Today, ACB may not be part of the standard of care for knee surgeries in every institution across the United States, but the nerve block has become much more widely practiced since its initial description in 2007.[1] Newer techniques developed in the past decade, such as the ACB and transversus abdominis plane blocks, are commonplace in clinical practice yet only now are being integrated into anesthesiology training with enough frequency to ensure proficiency by graduation. In today's fast-moving clinical environment, a 10-year lag is too slow. Novel regional anesthetic techniques should be integrated into residency training now for several key reasons.

"As instructors of regional anesthesia, our duty is to ensure that residency graduates are reasonably exposed to the most up-to-date, evidence-based, efficacious, and safe techniques available for the provision of patient care."

WE HAVE A RESPONSIBILITY AS REGIONAL ANESTHESIOLOGISTS IN ACADEMIC SETTINGS

As instructors of regional anesthesia, our duty is to ensure that residency graduates are reasonably exposed to the most up-to-date, evidence-based, efficacious, and safe techniques available for the provision of patient care. I would also argue that it is our duty as teachers to assess when a new technique has enough supportive evidence and adequate risk profile to be integrated into residency training in an expeditious manner. Furthermore, proficiency in a regional anesthesia technique does not develop over a weekend course or following limited patient encounters but rather requires at least 15 to 20 blocks for the proceduralist to experience consistent success and confidence.[2,3] Thus, residents should have adequate exposure to newer techniques during training, an environment where guiding expertise is immediately available and safety margins can be maximized.

GRADUATES NEED UP-TO-DATE SKILL SETS

In an era dominated by social media, electronic communication, and online resources, clinical integration of novel nerve block techniques has become more rapid than ever before. This has the potential to benefit patients and hospital administration by providing improved pain control, minimizing opioid use, and reducing lengths of hospital admissions.[4–6] Moreover, other medical specialties are using the techniques, with emergency medicine residencies increasingly incorporating peripheral nerve blockade into their curricula.[7,8] If our residency graduates are not as up to date and skilled in novel regional anesthesia techniques as other medical providers, we may see decreased demand for anesthesia services in areas outside the operating room.

WE SHOULD TEACH NOVEL TECHNIQUES TO FOSTER INNOVATIVE THINKING

The use of ultrasound guidance for peripheral nerve block placement during residency training has been steadily increasing over the past two decades. Among anesthesia residency programs in 2012, approximately 75% used an ultrasound for peripheral nerve blockade.[9] Today, ultrasound-guided regional anesthesia is fairly ubiquitous. Ultrasound's direct visualization of block targets has no doubt expanded residents' understanding of anatomy and enabled new approaches to traditional nerve blocks through innovative thinking. As educators, we should encourage our residents to expand this path of innovation as well as mentor trainees to assess the benefits and drawbacks of any novel technique through critical thinking. We should teach residents, via example, how to critically evaluate new techniques and compare them with the established blocks.

WE SHOULD HAVE A PRAGMATIC EDUCATIONAL APPROACH

A recent study demonstrated that the incorporation of regional anesthesia techniques into the management of surgical cases

has increased since 2000.[10] The current Accreditation Council for Graduate Medical Education anesthesia residency guidelines require the performance of 40 peripheral nerve blocks during training without any language that specifies which types of blocks should be included.[11] Different residents may require different amounts of exposure to be proficient in any given regional anesthesia procedure. For some residents, limiting training to meet minimum requirements for a list of core blocks would prevent them from being exposed to novel regional anesthesia techniques. Each residency program is unique in what it is able to offer. However, consider whether we should pause and, with a wide-angle lens, reflect on which blocks would be most useful for our trainees to learn, given trends in clinical practice.

CONCLUSION

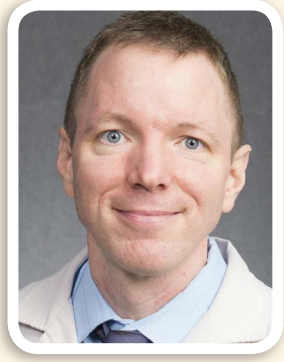
Anesthesiology trainees should be exposed to novel block techniques during residency. Doing so helps our graduates have up-to-date skills and encourages innovative thinking. As regional anesthesia experts, we should be aware of techniques that are poised to have the most significant impact on clinical practice and teach them to the next generation of anesthesiologists.

REFERENCES

1. Krombach J, Gray AT. Sonography for saphenous nerve block near the adductor canal. Reg Anesth Pain Med 2007;32:369–370.
2. Rosenblatt MA, Fishkind D. Proficiency in interscalene anesthesia—how many blocks are necessary? J Clin Anesth 2003;15:285–288.
3. Moon TS, Lim E, Kinjo S. A survey of education and confidence level among graduating anesthesia residents with regard to selected peripheral nerve blocks. BMC Anesthesiol 2013;13:16.
4. Kumar K, Kirksey MA, Duong S, Wu CL. A review of opioid-sparing modalities in perioperative pain management: methods to decrease opioid use postoperatively. Anesth Analg 2017;125:1749–1760.
5. Kettner SC, Willschke, Marhofer P. Does regional anaesthesia really improve outcome? Br J Anaesth 2011;107(S1):i90–i95.
6. Guay J, Parker MJ, Griffiths R, Kopp S. Peripheral nerve blocks for hip fractures. Cochrane Database Syst Rev 2017;5:CD001159.
7. Wilson CL, Chung K, Fong T. Challenges and variations in emergency medicine residency training of ultrasound-guided regional anesthesia techniques. AEM Educ Train 2017;1:158–164.
8. Amini R, Kartchner JZ, Nagdev A, Adhikari S. Ultrasound-guided nerve blocks in emergency medicine practice. J Ultrasound Med 2016;35:731–736.
9. Helwani MA, Saied NN, Asaad B, Rasmussen S, Fingerman ME. The current role of ultrasound use in teaching regional anesthesia: a survey of residency programs in the United States. Pain Med 2012;13(10):1342–1346.
10. Neal JM, Gravel Sullivan A, Rosenquist RW, Kopacz DJ. Regional anesthesia and pain medicine: US anesthesiology resident training—the year 2015. Reg Anesth Pain Med 2017;42:437–441.
11. Accreditation Council for Graduate Medical Education. ACGME program requirements for graduate medical education in anesthesiology. Available at: https://www.acgme.org/Portals/0/PFAssets/ProgramRequirements/040Anesthesiology2018.pdf?ver=2018-06-14-142529-527. Updated July 1, 2018. Accessed March 11, 2019.

CON Novel Block Techniques Should Not Be Taught During Anesthesiology Residency

Anesthesiology residencies should graduate physicians skilled in providing competent and safe ultrasound-guided regional anesthesia (UGRA). However, with an ever-increasing number of regional anesthetics available, including new peripheral nerve block and fascial plane blocks, the best method to provide regional anesthesia education and training is not known. Given residents' limited time and clinical exposure, the focus of their training should be in safe and proven regional anesthetic techniques and not in incorporating innovative or novel blocks.



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THE NUMBER OF BLOCKS IS DAUNTING

The remarkable interest in UGRA in the past 10 years has produced an increasing number of regional anesthetic techniques described in the literature. More than 40 regional anesthetic techniques can be taught to anesthesiology residents as part of a UGRA curriculum, some of which are listed in Figure 1. Previous work has identified learning curves that set the number of procedures a trainee or novice needs to perform to gain technical proficiency in a particular regional anesthesia technique.[1–3] Although the number of procedures needed varied by study and type of block, more than eight sessions and sometimes many times that number were necessary to establish technical proficiency. If multiple sessions are required to gain the technical skills necessary to perform just a single basic block, then residents are unable to gain the experience to be competent and safe at performing all types of regional anesthesia procedures during the limited time of residency. The question then becomes, which regional anesthetic techniques should be taught during residency?

> *"Teaching a small number of regional anesthetic techniques and the processes and rationale that guide them is more likely to produce competence than focusing on new and innovative blocks."*

GRADUATES NEED COMPETENCE IN SAFE AND EFFECTIVE UGRA

Residents have limited time and clinical exposure to gain skills and competence in performing safe and effective UGRA. It has been previously suggested that all residency graduates should master proficiency in a specified core group of widely applicable nerve blocks.[4] Establishing resident competence in a specified list of internationally agreed-upon regional anesthetic techniques could be an ideal way to improve regional anesthetic care. However, because of the large number of regional anesthetic techniques available, as well as variations in practice between residency training sites, this idyllic scenario is probably even further from reality today than when it was suggested in 2002.

Today, individual institutions tailor clinical pathways to the institution's particular resources and patient characteristics; therefore, residents at different institutions will have exposure to different regional anesthetic techniques. If proficiency in individual regional anesthetic techniques requires repetition, as the learning curves suggest, then requiring all residency graduates to be proficient in a specific list of blocks is likely unachievable. Instead, each individual institution should focus UGRA education for a small number of regional anesthetic techniques that are frequently performed at that institution. At my own institution, the acute pain service (APS) faculty selected 12 core regional techniques (see Figure 2) for residents on our APS rotation. During the APS rotation, education and evaluation of technical competence are focused on those 12 techniques. Focusing UGRA residency training away from novel or innovative blocks and toward proven blocks that can be performed in sufficient numbers is more likely to produce technical proficiency in performing particular blocks and overall competence in regional anesthesia.

TEACHING COMPETENT UGRA IS MORE THAN LEARNING BLOCK TECHNIQUES

Providing competent regional anesthesia care entails not just technical proficiency in performing blocks but also skills in clinical decision making, working on a team, and quality improvement.[5–7] Those nontechnical skills can be more difficult to teach and assess than technical proficiency yet are critical components of competency in regional anesthesia. Focusing regional anesthesia education on a small number of proven blocks and their associated safety and clinical decision pathways allows residents to learn both the technical and nontechnical aspects of those blocks. Developing critical decision-making skills for selected blocks in residency can serve as a template for future decision making in regional anesthesia and will prepare residents to incorporate yet-to-be described regional anesthesia techniques into their clinical practice following completion of their residency training.

The number of regional anesthesia techniques taught to ensure competence during residency may vary between institutions and even between individuals at a particular institution. However, teaching a small number of regional anesthetic techniques and the

Figure 1: *Regional anesthetic block techniques that could be taught during anesthesiology residency.*

Shoulder and Upper Extremity
Interscalene
Supraclavicular
Infraclavicular
Suprascapular
Axillary
Superficial cervical plexus
Deep cervical plexus
Bier
Digital nerve
Median nerve
Ulnar nerve
Radial nerve

Abdomen and Thorax
Pectoral nerve 1
Pectoral nerve 2
Paravertebral
Serratus plane
Erector spinae
Intercostal
Quadratus lumborum
Quadratus lumborum 2
Quadratus lumborum 3
Transversus abdominis plane (TAP)
Subcostal TAP
Rectus sheath

Back
Epidural, lumber
Epidural, thoracic
Spinal
Caudal
Lumbar plexus

Lower Extremity
Femoral
Adductor canal
Obturator
Lateral femoral cutaneous
Sciatic, popliteal approach
Sciatic, transgluteal approach
Sciatic, anterior approach
Sciatic, subgluteal approach
IPACK (interspace between the popliteal artery and the capsule of the posterior knee)
Ankle
Fascia iliaca

Figure 2: *Core blocks taught during acute pain service rotation.*

- Interscalene
- Supraclavicular
- Infraclavicular
- Paravertebral
- Epidural, thoracic
- Transversus abdominus plane (TAP)
- Subcostal TAP
- Femoral
- Adductor canal
- Sciatic, popliteal approach
- IPACK (interspace between the popliteal artery and the capsule of the posterior knee)
- Fascia iliaca

processes and rationale that guide them is more likely to produce competence than focusing on new and innovative blocks. It will also provide a solid foundation for residents to further their knowledge and skills by doing a fellowship program.

CONCLUSION

Regional anesthesia can provide a number of potential benefits for surgical patients. Accordingly, anesthesiology residencies are striving to provide competence in regional anesthesiology as part of a comprehensive training program. Although the clinical experience varies between individual residency programs, residents must learn technical and nontechnical aspects of regional anesthesia. Focusing regional anesthesia teaching on a small number of proven blocks that are part of proven clinical pathways rather than incorporating innovative or novel blocks into training is most likely to graduate residents who are competent in regional anesthesia.

REFERENCES

1. Rosenblatt MA, Fishkind D. Proficiency in interscalene anesthesia—how many blocks are necessary? J Clin Anesth 2003;15:285–288.
2. Barrington M, Wong D, Slater B, Ivanusic J, Ovens M. Ultrasound-guided regional anesthesia: how much practice do novices require before achieving competency in ultrasound needle visualization using a cadaver model. Reg Anesth Pain Med 2012;37:334–339.
3. Kopacz DJ, Neal JM, Pollack JE. The regional anesthesia "learning curve": what is the minimum number of epidural and spinal blocks to reach consistency? Reg Anesth 1996;21:182–190.
4. Hadzic A, Vloka J, Koenigsamen J. Training requirements for peripheral nerve blocks. Curr Opin Anaesthesiol 2002;15:669–673.
5. Neal J. Education in regional anesthesia: caseloads, simulation, journals, and politics. Reg Anesth Pain Med 2012;37:647–651.
6. Sites B, Chan V, Neal J, et al. The American Society of Regional Anesthesia and Pain Medicine and the European Society of Regional Anaesthesia and Pain Therapy joint committee recommendations for education and training in ultrasound-guided regional anesthesia. Reg Anesth Pain Med 2010;35(suppl 1): S74–S80.
7. Slater R, Castanelli D, Barrington M. Learning and teaching motor skills in regional anesthesia, a different perspective. Reg Anesth Pain Med 2014;39:230–239.

Medical Necessity, Documentation, Coding, and Billing for Spinal Cord Stimulation

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BACKGROUND

Chronic back pain affects a large portion of the global population, costing billions in direct and indirect medical costs and disrupting the lives of millions of people. In the United States alone, an estimated 7.9 million adults experience chronic back pain.[1]

Spinal cord stimulation (SCS) has become an important tool in the management of otherwise intractable pain and can be a life-changing therapy for many patients.[2] SCS targets the dorsal columns of the spinal cord for relief of neuropathic pain. Electrical stimulation of the spinal cord is approved by the Food and Drug Administration for chronic painful disorders of the trunk and extremities such as failed back surgery syndrome and complex regional pain syndrome types I and II.[3] Currently, the annual worldwide SCS system implantation rate is between 35,000 and 50,000 units.[4]

The efficacy, safety, and cost-effectiveness of traditional SCS for chronic pain conditions are well-established with level 1 and level 2 evidence.[5] In the treatment algorithm, SCS performed early in the course of patients' chronic pain processes is associated with better outcomes than SCS performed late in the disease. Research showed that success was inversely proportional to time between initial pain diagnosis and implantation, and the Neuromodulation Appropriateness Consensus Committee (NACC) recommended that SCS be considered and trialed within the first 2 years of chronic pain.[2,6]

COST

Substantial costs associated with the SCS system arise at the time of surgical implantation as well as at the time of revision (for reasons such as implantable pulse generator battery depletion, lead replacement, device malfunction, and infection).

Several cost-effectiveness analyses, spanning several different countries and cost/reimbursement patterns, have repeatedly demonstrated, at even relatively short follow-up periods (eg, 24 months or less), that patient-reported health outcomes are sufficiently improved such that widely accepted standards of "willingness to pay" are met. The break-even point at which savings associated with SCS are observed in therapy responders has been shown to be 2.1 to 2.5 years.[7]

Most data covering costs of SCS argue in favor of its cost-effectiveness for chronic neuropathic pain, especially in comparison to reoperation and medical management. A review of cost-effectiveness data implied that the largest reductions in health care expenditure come not only with consideration of SCS but also including it earlier as part of a comprehensive treatment paradigm.[7]

TRIALING

NACC recommended a multiday SCS trial for the treatment of pain to assess the therapy before committing to permanent implantation of an expensive and potentially more invasive device. Trialing is typically done with a pulse generator (current procedural terminology [CPT] code 63685) and two percutaneous leads (code 63650) or one paddle lead (code 63655).

Clinician assessment of the trial outcome includes evaluations of pain relief, improvement in patient function, associated treatment (especially medication) use, and any complications of therapy. From the patient's perspective, assessment includes acceptance and satisfaction with the outcomes of the treatment.[2] NACC recommended that a successful trial be defined as the patient experiencing and recording at least 50% pain relief during the trial.

"The opportunity for sizable profit resulted in a large number of unnecessary trials, evidenced by the fact that only 30% of patients progressed to permanent SCS implant. Unnecessary trials have decreased significantly because the exorbitant profits no longer exist."

As of 2014, the Healthcare Common Procedure Coding System (HCPCS) code L8680 is no longer separately billable for Medicare (the payment for electrodes was incorporated in CPT code 63650). The change simplified the reimbursement process for trials but also had a significant impact on the practice of trialing. Previously, a physician could purchase the trial devices for about $1,000 and receive approximately $6,000 reimbursement for the trial. The opportunity for sizable profit resulted in a large number of unnecessary trials, evidenced by the fact that only 30% of patients progressed to permanent SCS implant. Unnecessary trials have decreased significantly because the exorbitant profits no longer exist. Current reimbursement rates are approximately $1,800 per trial, which is also intended to cover the cost of the trial devices.

Table 1: *Healthcare Common Procedure Coding System (HCPCS) II device codes[a] (non-Medicare)[b]*

These codes are used by the entity that purchased and supplied the medical device, DME, drug, or supply to the patient. For implantable devices, that is generally the facility. It may also be the physician, most commonly for trial leads placed in the office. For specific Medicare hospital outpatient instructions for medical devices, see the Device C-codes (Medicare) below.		
Lead[c]	L8680	Implantable neurostimulator electrode, each
Pulse Generator[d]	L8679	Implantable neurostimulator generator, any type
	L8686	Implantable neurostimulator pulse generator, single array, nonrechargeable, includes extension
	L8687	Implantable neurostimulator pulse generator, dual array, rechargeable, includes extension
	L8688	Implantable neurostimulator pulse generator, dual array, nonrechargeable, includes extension
External Recharger	L8689	External recharging system for battery (internal) for use with implantable neurostimulator, replacement only
Patient Programmer	L8681	Patient programmer (external) for use with implantable programmable neurostimulator pulse generator, replacement only

Abbreviation: DME, durable medical equipment.
[a] Healthcare Common Procedure Coding System (HCPCS) Level II codes are maintained by the Centers for Medicare and Medicaid Services. http://www.cms.gov/Medicare/Coding/MedHCPCSGenInfo/index.html. Accessed November 21, 2017.
[b] This table is reprinted with the permission of Medtronic, Inc.©
[c] Physicians should not submit code L8680 to Medicare for leads placed in the office. This code is not separately billable to Medicare because the cost of the lead is already valued in the CPT procedure code. Centers for Medicare and Medicaid Services. MLN Matters Number MM8645. http://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNMattersArticles/downloads/MM8645.pdf. Accessed November 21, 2017. Code L8680 remains available for use with non-Medicare payers, although physicians should check with the payer for specific coding and billing instructions. Likewise, hospitals and ambulatory surgical centers (ASCs) may be able to submit L8680 for non-Medicare payers but should check with the payer for instructions.
[d] Effective January 2014, generator codes L8685–L8688 are not recognized by Medicare. Specifically, for billing Medicare, code L8679 is available for physician use, while hospitals typically use C-codes and ASCs generally do not submit HCPCS II codes for devices. For non-Medicare payers, codes L8685–L8688 remain available. However, all providers should check with the payer for specific coding and billing instructions.

Table 2: *Device C-codes[a] (Medicare)[b]*

Medicare provides C-codes for hospital use in billing Medicare for medical devices in the outpatient setting. Although other payers may also accept C-codes, regular HCPCS II device codes are generally used for billing non-Medicare payers. Unlike regular HCPCS II device codes, the extension is separately codable using C-codes. **ASCs, however, usually should not assign or report HCPCS II device codes for devices on claims sent to Medicare. Medicare generally does not make a separate payment for devices in the ASC. Instead, payment is "packaged" into the payment for the ASC procedure. ASCs are specifically instructed not to bill HCPCS II device codes to Medicare for devices that are packaged.[c]**		
Pulse Generator (nonrechargeable)	C1767	Generator, neurostimulator (implantable) nonrechargeable
Pulse Generator (rechargeable)[d]	C1820	Generator, neurostimulator (implantable), with rechargeable battery and charging system
Extension	C1883	Adaptor/extension, pacing lead or neurostimulator lead (implantable)
Leads	C1778	Lead, neurostimulator (implantable)
	C1897	Lead, neurostimulator, test kit (implantable)
Patient Programmer	C1787	Patient programmer, neurostimulator

Abbreviations: ASCs, ambulatory surgical centers; HCPCS, Healthcare Common Procedure Coding System.
[a] Device C-codes are HCPCS Level II codes and also maintained by the Centers for Medicare and Medicaid Services. Healthcare Common Procedure Coding System. http://www.cms.gov/Medicare/Coding/HCPCSReleaseCodeSets/Alpha-Numeric-HCPCS.html. Accessed November 21, 2017.
[b] This table is reprinted with the permission of Medtronic, Inc.©
[c] ASCs should report all charges incurred. However, only charges for nonpackaged items should be billed as separate line items. For example, the ASC should report its charge for the generator. However, because the generator is a packaged item, the charge should not be reported on its own line. Instead, the ASC should bill a single line for the implantation procedure with a single total charge, including not only the charge associated with the operating room but also the charges for the generator device and all other packaged items. Because of a Medicare requirement to pay the lesser of the ASC rate or the line-item charge, breaking these packaged charges out onto their own lines can result in incorrect payment to the ASC. Centers for Medicare and Medicaid Services. Medicare Claims Processing Manual, Chapter 14—Ambulatory Surgical Centers, Section 40. http://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/clm104c14.pdf. Accessed November 21, 2017. See also MLN Matters SE0742 pp. 9–10: Centers for Medicare and Medicaid Services. MLN Matters Number SE0742 Revised. http://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNMattersArticles/downloads/SE0742.pdf. Accessed November 21, 2017.
[d] HCPCS C-code C1822, Generator, neurostimulator (implantable), high frequency, with rechargeable battery and charging system, is also used for certain types of spinal neurostimulators. However, this code does not represent Medtronic spinal cord stimulation generators.

Table 3: *Current procedural terminology (CPT) procedure codes*[a]

Physicians use CPT codes for all services. Under Medicare's Resource-Based Relative Value Scale (RBRVS) methodology for physician payment, each CPT code is assigned a point value, known as the relative value unit (RVU), which is then converted to a flat payment amount.					
Procedure	CPT code and description[b]	Medical RVUs[c]		Medicare National Average[d]	
		For physician services provided in:[e]			
		Physician Office[f]	Facility	Physician Office[f]	Facility
Screening test[g,h,i]	**63650** Percutaneous implantation of neurostimulator electrode array, epidural[j,k]	37.59	11.83	$1,353	$426
Lead Implantation[g,h,i]	**63650** Percutaneous implantation of neurostimulator electrode array, epidural[j,k]	37.59	11.83	$1,353	$426
	63655 Laminectomy for implantation of neurostimulator electrodes, plate/paddle, epidural	N/A	24.07	N/A	$867
Generator Implantation or Replacement[h,l]	**63685** Insertion or replacement of spinal neurostimulator pulse generator or receiver, direct or inductive coupling	N/A	10.47	N/A	$377
Removal of Leads[h,m,n,o]	**63661** Removal of spinal neurostimulator electrode percutaneous array(s), including fluoroscopy, when performed	16.73	9.33	$602	$336
	63662 Removal of spinal neurostimulator electrode plate/paddle(s) placed via laminotomy or laminectomy, including fluoroscopy, when performed	N/A	24.33	N/A	$876
Revision or Replacement of Leads[h,n,o]	**63663** Revision including replacement, when performed, of spinal neurostimulator electrode percutaneous array(s), including fluoroscopy when performed	22.49	12.98	$810	$467
	63664 Revision including replacement, when per-formed, of spinal neurostimulator electrode plate/paddle(s) placed via laminotomy or laminectomy, including fluoroscopy when performed	N/A	25.33	N/A	$912
Revision or Removal of Generator[h,l]	**63688** Revision or removal of implanted spinal neurostimulator pulse generator or receiver	N/A	10.76	N/A	$387
Analysis/Programming Note: In the office, analysis and programming may be furnished by a physician, practitioner with an "incident to" benefit, or auxiliary personnel under the direct supervision of the physician (or other practitioner), with or without support from a manufacturer's representative. The patient or payer should not be billed for services rendered by the manufacturer's representative. Contact your local contractor or payer for interpretation of applicable policies.	**95970** Electronic analysis of implanted neurostimulator pulse generator system (eg, rate, pulse amplitude, pulse duration, configuration of wave form, battery status, electrode selectability, output modulation, cycling, impedance, and patient compliance measurements); simple or complex brain, spinal cord, or peripheral (ie, cranial nerve, peripheral nerve, sacral nerve, neuromuscular) neurostimulator pulse generator/transmitter, without reprogramming	1.97	0.69	$71	$25
	95971 Electronic analysis of implanted neurostimulator pulse generator system (eg, rate, pulse amplitude, pulse duration, configuration of wave form, battery status, electrode selectability, output modulation, cycling, impedance, and patient compliance measurements); simple spinal cord or peripheral (ie, peripheral nerve, sacral nerve, neuromuscular) neurostimulator pulse generator/ transmitter, with intraoperative or subsequent programming[p]	1.45	1.17	$52	$42
	95972 Electronic analysis of implanted neurostimulator pulse generator system (eg, rate, pulse amplitude, pulse duration, configuration of wave form, battery status, electrode selectability, output modulation, cycling, impedance, and patient compliance measurements); complex spinal cord or peripheral (ie, peripheral nerve, sacral nerve, neuromuscular) (except cranial nerve) neurostimulator pulse generator/transmitter, with intraoperative or subsequent programming[p]	1.67	1.19	$60	$43

Table 3: *Continued footnotes*

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[b] CPT copyright 2017 American Medical Association. All rights reserved. CPT® is a registered trademark of the American Medical Association (AMA). Applicable FARS/DFARS Restrictions Apply to Government Use. Fee schedules, relative value units, conversion factors, and/or related components are not assigned by the AMA, are not part of CPT, and the AMA is not recommending their use. The AMA does not directly or indirectly practice medicine or dispense medical services. The AMA assumes no liability for data contained or not contained herein.
[c] Centers for Medicare & Medicaid Services. Medicare Program; Payment Policies Under the Physician Fee Schedule and Other Revisions to Part B for CY 2018 Final Rule; 82 Fed. Reg. 52976-53371. https://www.gpo.gov/fdsys/pkg/FR-2017-11-15/pdf/2017-23953.pdf Published November 15, 2017. Accessed November 21, 2017. The total RVU as shown here is the sum of three components: physician work RVU, practice expense RVU, and malpractice RVU.
[d] Medicare national average payment is determined by multiplying the sum of the three RVUs by the conversion factor. The conversion factor for CY 2018 is $35.9996 per 82 Fed. Reg. 53344. https://www.gpo.gov/fdsys/pkg/FR-2017-11-15/pdf/2017-23953. Published November 15, 2017. Accessed November 21, 2017. See also the January 2018 release of the PFS Relative Value File RVU18A at http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeeSched/PFS-Relative-Value-Files.html. Released November 15, 2017. Accessed November 21, 2017. Final payment to the physician is adjusted by the Geographic Practice Cost Indices (GPCI). Also note that any applicable coinsurance, deductible, and other amounts that are patient obligations are included in the payment amount shown.
[e] The RVUs shown are for the physician's services, and payment is made to the physician. However, there are different RVUs and payments depending on the setting in which the physician rendered the service. "Facility" includes physician services rendered in hospitals, ambulatory surgical centers, and skilled nursing facilities. Physician RVUs and payments are generally lower in the "Facility" setting because the facility is incurring the cost of some of the supplies and other materials. Physician RVUs and payments are generally higher in the "Physician Office" setting because the physician incurs all costs there.
[f] "N/A" shown in Physician Office setting indicates that Medicare has not developed RVUs in the office setting because the service is typically performed in a facility (eg, in a hospital). However, if the local contractor determines that it will cover the service in the office, then it is paid using the facility RVUs at the facility rate. Centers for Medicare & Medicaid Services. Details for Title: CMS-1676-F. CY 2018 PFS Final Rule Addenda. Addendum A: Explanation of Addendum B and C. https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeeSched/PFS-Federal-Regulation-Notices-Items/CMS-1676-F.html. Released November 6, 2017. Accessed November 21, 2017.
[g] As defined and as published by the AMA (*CPT Assistant,* June 1998, p. 4), these codes represent a single lead. When more than one lead is placed, each is coded separately. However, Medicare does not permit the use of bilateral modifier –50 or –LT/ –RT on these codes. Some payers recognize that each code represents a distinct lead when modifier –51 or modifier –59 is appended to the additional codes. Note that Medicare's Medically Unlikely Edits allow 2 units for code 63650 on the same date of service but only 1 unit for code 63655. Denials for units in excess of the MUE values may be appealed.
[h] Surgical procedures are subject to a "global period." The global period defines other physician services that are generally considered part of the surgery package. The services are not separately coded, billed, or paid when rendered by the physician who performed the surgery. These services include preoperative visits the day before or the day of the surgery, postoperative visits related to recovery from the surgery for 10 or 90 days depending on the specific procedure, treatment of complications unless they require a return visit to the operating room, and minor postoperative services such as dressing changes and suture removal.
[i] The published vignettes for codes 63650 and 63655 include fluoroscopy, and, according to guidelines published by the American Association of Neurological Surgeons (2017 *AANS Guide to Coding,* 2016 Edition, p. 68), its use is inherent to lead implantation and should not be coded separately. In addition, National Correct Coding Initiative (NCCI) edits prohibit coding fluoroscopy separately with 63650 and 63655. See also *CPT Assistant,* January 2016, p. 12.
[j] The Physician Office RVUs for code 63650 are valued to include payment for the lead and other practice expenses associated with office-based lead insertion, eg, trials. HCPCS code L8680 should not be reported separately for the lead in conjunction with office-based lead insertion.
[k] The AMA has published (*CPT Assistant,* October 2013, p. 19) that the use of an incision to admit the needle or to anchor the lead is inherent to percutaneous placement and does not alter the use of code 63650. See also *2017 AANS Guide to Coding,* p. 68.
[l] When an existing generator is removed and replaced by a new generator, only the generator replacement code 63685 may be assigned. NCCI edits do not allow removal of the existing generator to be coded separately. Also note that, according to NCCI policy, use of the CPT code for generator "insertion or replacement" requires placement of a new generator. When the same generator is removed and then reinserted, the "revision" code is used (NCCI Policy Manual 1/1/2018, p. VIII-8).
[m] The AMA has published that the work of removing a temporary trial lead is inherent to the original percutaneous placement code 63650 and is not coded separately. Code 63661 cannot be assigned for removal of a temporary trial lead that was placed percutaneously. Further, codes 63661 and 63662 apply to surgical removal of permanent leads. Removal of a permanent lead by simple pull is not coded (*CPT Assistant,* August 2010, p. 8,15; April 2011, pp. 10–11, 15).
[n] The AMA has published that replacement codes 63663 and 63664 are assigned when a permanent lead is replaced by another permanent lead of the same type via the same approach at the same spinal level. The work of removing the existing permanent lead is included and is not coded separately (*CPT Assistant,* August 2010, p. 8,15; April 2011, pp. 10–11, 15). In addition, NCCI edits do not permit removal codes 63661 and 63662 to be assigned separately with replacement codes 63663 and 63664.
[o] The AMA has published that when a permanent percutaneous lead is removed and a new lead is placed via a fresh laminectomy at the same or a different spinal level, insertion code 63655 is assigned with removal code 63661 (*CPT Assistant,* April 2011, pp. 11, 15). NCCI edits allow this combination without use of a modifier.
[p] According to CPT manual instructions, "simple" programming involves changes to three or fewer parameters and "complex" programming involves changes to four or more parameters. The parameters that qualify are rate, pulse amplitude, pulse duration, pulse frequency, eight or more electrode contacts, cycling, stimulation train duration, train spacing, number of programs, number of channels, alternating electrode polarities, dose time (stimulation parameters changing in time periods of minutes including dose lockout times), assessing more than one clinical feature. (See also *CPT Assistant,* July 2016, p. 7 and p. 9.)

BILLING CODES

Diagnosis codes document the indication for the procedure. Pain codes from the G89 series are used as the principal diagnosis when the encounter is for pain control or pain management, rather than for management of the underlying condition. Neurostimulation therapy is directed at managing chronic, intractable pain rather than treating the underlying disorder. When a patient is admitted for insertion of a neurostimulator for pain control, the pain code is sequenced as the principal diagnosis.[8] Additional codes may then be assigned to identify the underlying cause and to give more detail about the nature and location of the pain.

Tables 1 and 2 provide HCPCS II device codes for non-Medicare and Medicare billing, respectively. Table 3 provides CPT codes for physician payment.

Beyond reimbursement for the trial and permanent devices, programming codes are applicable for office visits (see Table 3). Programming codes cannot be used for the initial implant

procedure and should be used only when the physician or a direct employee is performing the programming.

RECENT TECHNOLOGIC ADVANCEMENTS

Technologic advancements such as novel waveforms, higher-stimulation frequencies, and new anatomical targets have vastly expanded the field of SCS, resulting in greater efficacy and broader applicability.[5]

In 2015, the SEZNA-RCT trial demonstrated that the HF10 waveform was significantly better than traditional SCS in terms of the proportion of responders (84.5% of subjects were HF10 responders for back pain and 83.1% were HF10 responders for leg pain, compared with 43.8% of subjects for back pain and 55.5% for traditional SCS for leg pain).[9] In the field of pain management, clinicians generally appreciate a response rate of more than 40% as better than most available therapies; the fact that a new waveform essentially doubles the response rate is extremely encouraging for the potential of this relatively novel therapy.

In 2017, the SUNBURST study showed that burst stimulation is superior over tonic stimulation and preferred by significantly more patients.[10] Interestingly, 69% of subjects responded to tonic stimulation, burst stimulation, or both. For the individual stimulation modes, 60% of subjects were responders to burst stimulation and 51% to tonic stimulation.[10] This is another example of the incremental effect that the development of new stimulation parameters can have on therapy response and patient satisfaction rates.

In addition to improving response rates, the advancements can help physicians to optimize stimulation settings for patients earlier in the therapy timeline, which may ensure that the therapy continues successfully beyond the cost-effectiveness break-even point. That notion further underscores the importance of ongoing development of stimulation parameters that will continue to advance the therapy, making its future brighter with even better outcomes.

REFERENCES

1. Staats P. Trial design and endpoint evaluation in clinical studies addressing chronic back pain. Spine 2017;42:S93–S97.
2. Deer TR, Mekhail N, Provenzano D, et al. The appropriate use of neurostimulation of the spinal cord and peripheral nervous system for the treatment of chronic pain and ischemic diseases: the Neuromodulation Appropriateness Consensus Committee. Neuromodulation 2014;17:515–550.
3. Deer TR, Krames E, Mekhail N, et al. The appropriate use of neurostimulation: new and evolving neurostimulation therapies and applicable treatment for chronic pain and selected disease states. Neuromodulation 2014;17:599–615.
4. Provenzano DA, Amirdelfan K, Kapural L, et al. Evidence gaps in the use of spinal cord stimulation for treating chronic spine conditions. Spine 2017;42:S80–S92.
5. Kapural L, Peterson E, Provenzano DA, et al. Clinical evidence for spinal cord stimulation for failed back surgery syndrome (FBSS). Spine 2017;42:S61–S66.
6. Kumar K, Hunter G, Demeria D. Spinal cord stimulation in treatment of chronic benign pain: challenges in treatment planning and present status, a 22-year experience. Neurosurgery 2006;58:481–496.
7. Hoelscher C, Riley J, Wu C, et al. Cost-effectiveness data regarding spinal cord stimulation for low back pain. Spine 2017;42:S80–S92.
8. Centers for Disease Control and Prevention. ICD-10-CM official guidelines for coding and reporting FY 2018, I.C.6.b.1 (a). Available at: https://www.cdc.gov/nchs/data/icd/10cmguidelines_fy2018_final.pdf. Accessed March 29, 2019.
9. Kapural L, Yu C, Doust MW, et al. Novel 10-kHz high-frequency therapy (HF10 therapy) is superior to traditional low-frequency spinal cord stimulation for the treatment of chronic back and leg pain: the SENZA-RCT randomized controlled trial. Anesthesiology 2015;123:851–860.
10. Deer T, Slavin KV, Amirdelfan K, et al. Success using neuromodulation with BURST (SUNBURST) study: results from a prospective, randomized controlled trial using a novel burst waveform. Neuromodulation 2018;21:56–66.

The Impact of Advance Practice Provider Restrictions on Opioid Use Disorder

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As pain specialists, we are well aware of the devastating effects from the current opioid crisis. The epidemic has numerous social and health-related implications, including substantial increases in the incidence of addiction, communicable disease, neonatal abstinence syndrome, violent crime, disruption of communities and families, and overdose-related deaths. Opioid misuse has created a nation in crisis, with more than 2 million cases of opioid use disorder (OUD) diagnosed in 2015 and subsequent rises in heroin use.[1,2] More than 72,000 Americans died from opioid-related causes in 2017, with close to 16,000 of those deaths from heroin.[3]

In response to the growing number of opioid prescriptions and opioid-related deaths, the Centers for Disease Control and Prevention published prescribing guidelines and several states passed legislation successfully reducing the opioid supply. However, appropriate treatment options are lacking for those dependent on opioids, especially in rural areas of the United States.

Current evidence supports medication-assisted therapy (MAT) as the most effective treatment for OUD.[4,5] MAT combines medications approved by the Food and Drug Administration (FDA) with psychological interventions, including counseling and behavioral therapies, to comprehensively treat OUD. Methadone, buprenorphine, and naltrexone are the only FDA-approved MAT medications. Buprenorphine MAT has been associated with fewer adverse effects as well as improved fetal outcomes when initiated during pregnancy.[5–8]

Unfortunately, access to MAT is limited, with the number of patients in need far exceeding that of qualified providers.[9,10] In 2015, less than 50% of U.S. counties had a physician prescriber and most of the deficit in rural areas.[11] Based on current estimations, only 3% of all primary care providers have waivers to prescribe buprenorphine for OUD.[11] Additional barriers to MAT availability include geographic location, socioeconomic circumstances, and stigma regarding addiction.[11–17]

Prescribing buprenorphine maintenance treatment (BMT) requires specialty training with strict regulations on the number of patients each provider may treat. Currently, buprenorphine is a schedule III drug, and advanced practice providers are allowed to prescribe it for pain; however, many states have restrictions for addiction treatment.[18] Although section 303 of the federal Comprehensive Addiction and Recovery Act authorized physician assistants and nurse practitioners to prescribe BMT, many state laws restrict or even prohibit advanced practice providers from prescribing buprenorphine for addiction.[19]

"Because of current state restrictions on buprenorphine prescribing, advance practice providers who diagnose opioid dependence and OUD are unable to provide evidence-based treatment for their patients."

The management of opioid dependence and OUD frequently defaults to primary care providers, especially in areas with limited access to addiction and chronic pain specialists. Advance practiced providers often serve rural areas to meet health care needs and, in certain states, practice independently.[20] Patients in rural regions may have limited financial and psychosocial resources, further restricting their ability to seek appropriate treatment for OUD. Health Resources and Services Administration projections estimate that physician assistants and nurse practitioners will provide up to 28% of primary care services by 2020.[21] But because of current state restrictions on buprenorphine prescribing, advance practice providers who diagnose opioid dependence and OUD are unable to provide evidence-based treatment for their patients.

Currently, three states (Oklahoma, Tennessee, and Wyoming) explicitly prohibit nurse practitioners from providing BMT, and 28 states place prescribing restrictions on the treatment.[22] Scientific evidence is lacking to support those practice restrictions, and analysis of state-

level scope-of-practice restrictions displays no evidence of improved quality of care in those states.[23] In fact, states with reduced or restricted nurse practitioner scope of practice use more resources such as hospitalizations, readmissions, and emergency department admissions than full-practice states.[24] Prescribing limitations reduce the pool of qualified MAT providers and place patients at greater risk for misuse, overdose, and death. Equipping advance practice providers with BMT prescribing privileges could significantly increase the availability of OUD treatment specialists and improve access to care for those with OUD.[24]

REFERENCES

1. Han B, Compton WM, Blanco C, Crane E, Lee J, Jones CM. Prescription opioid use, misuse, and use disorders in U.S. adults: 2015 National Survey on Drug Use and Health. Ann Intern Med 2017;167:293–301.
2. Kanouse AB, Compton P. The epidemic of prescription opioid abuse, the subsequent rising prevalence of heroin use, and the federal response. J Pain Palliat Care Pharmacother 2015;29:102–114.
3. National Institute on Drug Abuse. Overdose death rates. Available at: https://www.drugabuse.gov/related-topics/trends-statistics/overdose-death-rates. Updated January 2019. Accessed March 4, 2019.
4. Dematteis M, Auriacombe M, D'Agnone O, et al. Recommendations for buprenorphine and methadone therapy in opioid use disorder: a European consensus. Expert Opin Pharmacother 2017;18:1987–1999.
5. Connery HS. Medication-assisted treatment of opioid use disorder: review of the evidence and future directions. Harv Rev Psychiatry. 2015;23:63–75.
6. Coyle MG, Salisbury AL, Lester BM, et al. Neonatal neurobehavior effects following buprenorphine versus methadone exposure. Addiction 2012;107(suppl 1):63–73.
7. Noormohammadi A, Forinash A, Yancey A, Crannage E, Campbell K, Shyken J. Buprenorphine versus methadone for opioid dependence in pregnancy. Ann Pharmacother 2016;50:666–672.
8. Thomas CP, Fullerton CA, Kim M, et al. Medication-assisted treatment with buprenorphine: assessing the evidence. Psychiatr Serv 2014;65:158–170.
9. Hutchinson E, Catlin M, Andrilla CH, Baldwin LM, Rosenblatt RA. Barriers to primary care physicians prescribing buprenorphine. Ann Fam Med 2014;12:128–133.
10. Jenkinson J, Ravert P. Underutilization of primary care providers in treating opiate addiction. J Nurse Pract 2013;9:516–122.
11. Rosenblatt RA, Andrilla CH, Catlin M, Larson EH. Geographic and specialty distribution of US physicians trained to treat opioid use disorder. Ann Fam Med 2015;13:23–26.
12. Woods JS, Joseph H. Reducing stigma through education to enhance medication-assisted recovery. J Addict Dis 2012;31:226–235.
13. Wielen LM, Gilchrist EC, Nowels MA, Petterson SM, Rust G, Miller BF. Not near enough: racial and ethnic disparities in access to nearby behavioral health care and primary care. J Health Care Poor Underserved 2015;26:1032–1047.
14. Stein BD, Dick AW, Sorbero M, et al. A population-based examination of trends and disparities in medication treatment for opioid use disorders among medicaid enrollees. Subst Abus 2018;22:1–7.
15. Scott A, Witt J, Humphreys J, et al. Getting doctors into the bush: general practitioners' preferences for rural location. Soc Sci Med 2013;96:33–44.
16. Salsitz E, Wiegand T. Pharmacotherapy of opioid addiction: "putting a real face on a false demon." J Med Toxicol 2016;12:58–63. https://doi.org/10.1007/s13181-015-0517-5
17. Fagan EB, Gibbons C, Finnegan SC, et al. Family medicine graduate proximity to their site of training: policy options for improving the distribution of primary care access. Fam Med 2015;47:124–130.
18. DEA Diversion Control Division. Mid level practitioners: controlled substance authority by discipline within state 2018. Available at: https://www.deadiversion.usdoj.gov/drugreg/practioners/mlp_by_state.pdf. Accessed March 4, 2019.
19. St. Marie B, Arnstein P, Zimmer PA. Pain and opioids: call for policy action. J Nurse Pract 2018;14:40–44.
20. O'Connor AB. Nurse practitioners' inability to prescribe buprenorphine: limitations of the Drug Addiction Treatment Act of 2000. J Am Acad Nurse Prac 2011;23:542–545.
21. HRSA Health Workforce. Projecting the supply and demand for primary care practitioners through 2020. Available at: https://bhw.hrsa.gov/health-workforce-analysis/primary-care-2020. Published November 2013. Accessed March 4, 2019.
22. Jackson HJ, Lopez CM. Utilization of the nurse practitioner role to combat the opioid crisis. J Nurse Pract 2018;14:213–216.
23. Perloff J, Clarke S, DesRoches CM, O'Reilly-Jacob M, Buerhaus P. Association of state-level restrictions in nurse practitioner scope of practice with the quality of primary care provided to Medicare beneficiaries. Med Care Res Rev 2017:1077558717732402.
24. Buerhaus P. Nurse practitioners: a solution to America's primary care crisis. Available at: http://www.aei.org/wp-content/uploads/2018/09/Nurse-practitioners.pdf. Published September 2018.

Going the Distance: Sustainability in a Regional Anesthesia and Pain Medicine Center

How do we create sustainability in an anesthesia career? How do we chart a path that provides professional fulfillment? These are questions that members of our profession often wrestle with. I grapple with them as well and discuss them with my mentors, peers, fellows, and residents. If we consider our work satisfaction on a spectrum, with one end representing engagement and the other end burnout, how do we move toward the positive end and avoid the negative one?

The term *burnout* was coined by psychologist Herbert Freudenberg, who described it as a response to stress and frustration and to a demand that an individual may make on themselves in terms of a requirement for perfectionism or drive.[1] Christina Maslach developed the Maslach Burnout Inventory (MBI) as a validated metric to assess for burnout. The MBI is composed of three domains:

1. Emotional exhaustion ("I feel burned out from my work")
2. Depersonalization ("I feel I treat some patients as if they were impersonal objects")
3. Lack of personal accomplishment ("I don't feel I'm positively influencing others through my work")[2]

Burnout has been described as "an erosion of the soul,"[3] and its prevalence for medical personnel is high. In a study of more than 7,200 physicians, 46% had at least one symptom of burnout.[4] Anesthesiologists have burnout rates slightly higher than the average physician surveyed in that study.

Anesthesiologists face several stressors that can potentiate burnout. Being an anesthesiologist requires coping with time and production pressure, functioning in a high-stress environment, taking care of critically ill patients, responding to critical events, and having access to addictive drugs.

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In work environments, six factors have been associated with burnout: workload (with inadequate recovery time), control (lack of autonomy), reward (no recognition), community (lack of), fairness (lack of), and values (conflicting between an individual and an institution). From a work perspective, the best-case scenario is an individual finding a job with a workload with adequate recovery, a sense of control, reward (financial and acknowledgment of work efforts), sense of community, fairness, and values that match his or her own.[5]

With those challenges, how do we move toward sustainability? Our relationships—personal and professional—are key.

Anesthesiologists pride themselves on control in the operating room. Functioning outside of the operating room in environments that are unpredictable and out of our control requires us to adjust our expectations. Jon Kabat-Zinn, a professor emeritus of medicine at the University of Massachusetts Medical Center, wrote a book titled *Full Catastrophe Living* that addresses the concept that life encompasses "a supreme appreciation for the richness of life and the inevitability of all its dilemmas, sorrow, tragedies, and ironies . . . the human spirit's ability to come to grips with what is most difficult in life and to find within it room to grow in strength and wisdom."[6]

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For our own personal growth, we must recognize that although we cannot fully control what happens around us, we can control our own reactions. We can engage in self-reflection: What motivates me professionally, what do I like most about my job, why did I choose to be an anesthesiologist?[7]

In my personal experience, one of the greatest joys of my job is engaging and bantering with patients before, during, and after surgery and making them feel more comfortable and relaxed with their perioperative experience. As a regional anesthesiologist, this is a great career fit that allows me to connect with patients and interact with them. Their fear of having a nerve block often metamorphoses into, "That is so interesting; can I watch my nerve block on the screen [ultrasound]?" This is deeply satisfying for me and makes my job rewarding on a daily basis.

As our goals and priorities change over time, we may need to reconsider our job opportunities. We need to ask ourselves, "What are our greatest priorities? Do we have adequate balance between our personal and professional lives? How much professional achievement are we willing to sacrifice to have more personal time or a better relationship with my family or children?"[7] Once we identify our

priorities, it will become clearer which responsibilities should get our time and attention.

Those are challenging questions with complex answers. The work of self-reflection is ongoing. Organizations also have a responsibility to provide an atmosphere that allows anesthesiologists to flourish. Goals need to be aligned. Work culture should strive to provide inclusivity and equal opportunities, support, mentorship, nonjudgmental feedback, and debriefing. Engaged work environments feature sustainable workloads with the option of flexible work schedules, supportive technology, and opportunities to empower employees and make them feel recognized and valued for their work. Therefore, strong, supportive leadership is critical for an organization to flourish. This in turn will attract high-quality personnel to work in the department and make a positive contribution for it to grow.

Our society is tempted to want a quick fix or to hold out for an epiphany of what matters most. In our daily lives, we have a chance to decide how we spend our time, with whom we spend it, what is in our control, and what is not. In those small moments, how we spend our minutes, hours, days, and years shape our experiences. Perspective matters. As Winston Churchill stated, "A pessimist sees the difficulty in every opportunity; an optimist sees the opportunity in every difficulty."

We can take each opportunity to mindfully maximize our fulfillment and remember the gratitude and privilege we have for being physicians.

REFERENCES

1. King N. When a psychologist succumbed to stress, he coined the term 'burnout.' Available at: https://www.npr.org/2016/12/08/504864961/when-a-psychologist-succumbed-to-stress-he-coined-the-term-burnout. Updated December 8, 2016. Accessed March 9, 2019.
2. Maslach C, Jackson SE, Leiter MP. Maslach Burnout Inventory Manual. 3rd ed. Palo Alto, California: Consulting Psychologists Press; 1996.
3. Maslach C, Leiter MP. The truth about burnout. San Francisco, California: Josey-Bass; 1997.
4. Shanafelt TD, Boone S, Tan L, et al. Burnout and satisfaction with work-life balance among US physicians relative to the general US population. Arch Intern Med 2012;172:1377–1385.
5. Maslach C, Leiter MP. Early predictors of job burnout and engagement. J Appl Psychol 2008;93:498–512.
6. Kabat-Zinn J. Full Catastrophe Living. New York, New York: Dell; 1991.
7. Shanafelt T, Chung H, White H, et al. Shaping your career to maximize personal satisfaction in the practice of oncology. J Clin Oncol 2006;24:4020–4026.

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