

# ASRA NEWS

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

## AUGUST 2020



### THE LEADERSHIP/MENTORSHIP ISSUE

Regional Fellowship  
Training - *page 7*

What Makes a Great  
Leader? - *page 16*

The Beauty of Diversity  
in Medicine - *page 10*

What Showing Up Can  
Do for You - *page 23*



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

# Table of Contents

President's Message: How Do I Get Involved with ASRA? ____	3
Editor's Message: Help! _____	5
Regional Fellowship-Trained Versus Non-Fellowship Trained Consultants: Does It Matter? _____	7
The Beauty of Diversity in Medicine _____	10
Leadership Qualities: What Makes a Great Leader? ____	16
Physician Mentorship and Leadership Development Special Interest Group _____	20
What Showing Up Can Do for You _____	23
How I Do It: A Pathway for Total Knee Arthroplasty ____	25
Cannabis as an Analgesic: Separating Hope from Hype _____	29
Virtual Reality for Pain Management: A Guide to Clinical Implementation _____	32
How I Do It: Stellate Ganglion Blocks _____	36
Sympathetic Blocks for Postoperative Pain Control After Surgery: Literature Review and Current Evidence _____	39
Surgical Considerations for Spinal Cord Stimulation Implant _____	41
Radiofrequency Ablation and Its Role in Treating Chronic Pain _____	47
Transforming Acute Pain Management in Sickle Cell Disease: Where Are We Now? _____	50
Regional Nerve Blockade: What's the Long Game? ____	55
Literature Review _____	57

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# President's Message: How Do I Get Involved with ASRA?

If there is one question I am asked more than any other it is "How do I get involved with ASRA?" As we navigate through this extraordinary time, it is more important than ever for our ASRA family to come together. Whether you are new to ASRA or joined many years ago, we encourage you to be an active member of the Society and help shape our future offerings.

While nothing can replace a live meeting and human interaction, the virtual world has come to the forefront for engaging with family, friends, and colleagues. The [ASRA Connect](#) online community is a great place to share your experiences, ask questions, and provide expert advice. ASRA members can use the [Member Directory](#) to connect with colleagues and friends. When it is time to meet again at the in-person annual meetings, be sure to join us at the Welcome Reception, participate in ASRA Let's Eat, and celebrate at the Annual Meeting Reception. These connections will provide a sense of community for which we are all yearning and looking forward to in the future.

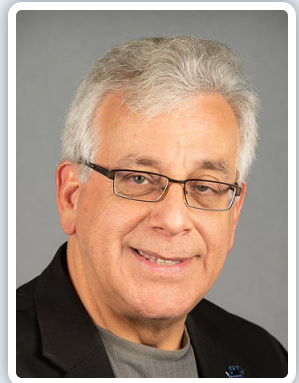
The [ASRA Special Interest Groups \(SIGs\)](#) offer a variety of ways to be involved. Look among the many areas of special interests and consider joining one or more that aligns with your goals and interests. You will interact with like-minded colleagues who wish to move ASRA forward with a special goal or initiative. The SIG families are always looking for volunteers to serve on their leadership teams and help create content. Offer to write an article or create a webcast on a topic important to you. Each SIG has its own online community in ASRA Connect to share successes and challenges and exchange resources. With 22 SIGs covering a variety of topics, there is sure to be a SIG for everyone. And, if you can't find something of interest to you, let us know. New SIGs are formed by members actively pursuing and creating what doesn't already exist. A group of members did just that and established the Physician Mentorship and Leadership Development SIG. Later in this newsletter you will hear about their SIG and a new opportunity with the launch of the ASRA Mentor Match Program. Soon we will have a Wellness SIG, and others, such as a Complementary and

Integrative Medicine SIG, are in discussion.

The *Regional Anesthesia & Pain Medicine* journal is always looking for reviewers. Peer-reviewers play a critical role in reviewing the science, research, accuracy, and clarity of submitted manuscripts. Physicians, PhDs, psychologists, and others working in the field are invited to participate. To apply, go to <https://mc.manuscriptcentral.com/rapm> and create an account. Indicate your areas of expertise using the keywords section. Please reach out to [info.rapm@bmj.com](mailto:info.rapm@bmj.com) or [asraeditor@asra.com](mailto:asraeditor@asra.com) with any questions you may have about this process.

The [ASRA Committees](#) provide another way to contribute to your Society. If you are concerned with issues related to regulatory advocacy, guidelines, practice advisories, or standards, volunteer to serve on the ASRA Guidelines and Regulatory Advocacy Committee, or if you are interested in developing programs, products, and services to support the needs of new professionals aspiring to be faculty and researchers, volunteer for the ASRA Faculty Development

Committee. ASRA has more than 10 standing committees, which are always looking for new, innovative committee members to participate. With approximately 40% of committee appointments being members who have never served on an ASRA committee, we value the importance of bringing new thought leaders to the table every year. The Call for ASRA Volunteers is sent each September, with committee terms commencing the following spring. Please [click here](#) to be notified when the nominations process opens.



Eugene R. Viscusi, MD  
ASRA President

*"With approximately 40% of committee appointments being members who have never served on an ASRA committee, we value the importance of bringing new thought leaders to the table every year."*

Perhaps the first step is to be visible! Come to a meeting. Consider submitting an abstract, case report or QA/QI project, and be part of the meeting. Identify yourself as someone new or someone interested in getting involved. Talk to SIG leaders and express your interests. Join a virtual event and participate in the conversation. ASRA is a wonderful family, one that has been the highlight of my career.

I hope all of you will consider one of the many opportunities to get involved, be active, and come together. I look forward to working more closely with many of you in the very near future. After all, we are family, and together we can further our mission of improving patient outcomes through research, education, and advocacy by sharing our knowledge and expertise. Be well and stay safe!



# Editor's Message: Help!

*I'm so tired, I haven't slept a wink  
I'm so tired, my mind is on the blink*

"I'm So Tired" – The Beatles. 1968.

*It's been a hard day's night, and I've been working like a dog  
It's been a hard day's night, I should be sleeping like a log  
But when I get home to you, I'll find the things that you do  
Will make me feel alright*

"A Hard Day's Night" – A Hard Day's Night. 1964.

Universal truths for medical providers include being asked to accomplish too much in too little time. See too many patients and assimilate too many new procedures and surgical indications into the daily schedule while teaching the next generation of students/residents and documenting too many procedures in an EMR that may not make a bit of sense. At the same time, there is a compelling need to engage in research that advances the science of our profession and attend to a tapestry of administrative responsibilities that are required to keep the operating rooms operating.

*Many times I've been alone  
And many times I've cried  
Anyway you'll never know  
The many ways I've tried*

"The Long and Winding Road" – Let it Be. 1970.

Unfortunately, it may seem that the path to completing each one of these tasks can be a lonely one without much chance of support or recognition. Like Father McKenzie writing the words that no one will hear, toiling in a vacuum can lead each of us to wonder if our expended energy is warranted or valued. While local senior mentorship can be invaluable, each institution is blessed with a different set of faculty and circumstances that might facilitate (or not) the ability to support junior faculty as they work towards academic achievement, research, and clinical protocol development.

I have always been fortunate in my place of work to have faculty available that were interested in my clinical and personal development. When I found myself in times of trouble, Papa Ford (mentor Dr. Michael Ford) was there for me to serve as a role model for how to provide patient-centered care, treat your colleagues with respect, and remain someone that your kids and spouse are happy to see at the end of the day. Whenever I needed motivation to strive for promotion to the next academic

level or muster the courage to ask/apply for an academic opportunity, Dr. George Arndt (inventor of the Arndt endobronchial blocker and airway exchange catheter kit) was there for me. If I needed someone to commiserate or collaborate with, I had a peer in Dr. Melanie Donnelly, who helped me place academic or personal setbacks into perspective. However, I could not always find everything that I needed at the time that I needed it within my home institution. I was therefore fortunate that there were faculty within ASRA who have sacrificed some of themselves to assist me in my academic career. Finding these amazing faculty was not easy but the payoff, support, and guidance that they have provided has been tremendous.

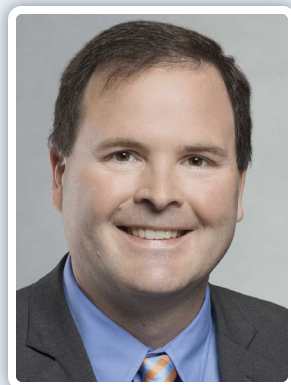
*Oh, I get by with a little help from my friends  
Mm, gonna try with a little help from my friends  
Oh, I get high with a little help from my friends  
Yes, I get by with a little help from my friends  
With a little help from my friends*

"With a Little Help from My Friends" – Sgt. Pepper's Lonely Hearts Club Band. 1967.

This is where we need the help of the broader ASRA membership to ensure that all faculty members have the opportunity to benefit from meaningful mentorship relationships and obtain the support and guidance that they need to achieve in leadership positions, develop clinical protocols, succeed in clinical research, or maintain balance between clinical and family commitments. Think back to the first couple of annual meetings that you attended – how much more enjoyable and beneficial would these experience have been if you had one more person who knew your name and was interested and invested in your success?

*Will you still need me, will you still feed me  
When I'm sixty-four*

"When I'm Sixty-Four" – Sgt. Pepper's Lonely Hearts Club Band. 1967.



Kristopher M. Schroeder, MD  
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Fortunately, within ASRA there exists a tremendous wealth of leadership and mentorship capital that can be leveraged to ensure that our next generation of physician leaders is equipped to assume leadership roles and advance the science of our profession. If you are 64 (or thereabouts), we need you to lead and mentor the growing group of mid-career faculty that are working to become the next leaders in the field. If you are one of those mid-career faculty, we need you to mentor the faculty who are just starting their careers and encourage them to start that first research project, submit their first panel proposal, or simply sit next to them at our annual meetings. If you are just starting your career, we need you as well to help guide residents toward a career in regional anesthesia and pain medicine or help fellows

make career decisions that facilitate their ability to succeed.

*And in the end  
The love you take  
Is equal to the love you make*

“The End” – Abbey Road. 1969.

All of us are stronger together, and the success of any one ASRA faculty member is one that is shared by the entire group. Please consider joining in this mentorship undertaking by applying to become both a mentor and a mentee [here](#).

# Regional Fellowship-Trained Versus Non-Fellowship Trained Consultants: Does It Matter?

## INTRODUCTION

*"It is the greatest happiness of the greatest number that is the measure of right and wrong."*

— Jeremy Bentham, 1776

The simple answer to the question posed in the title of this article is YES, it matters! The explanation, however, is more complex, and the authors would like to stress from the outset that every anesthesia practitioner should be able to perform core ultrasound-guided regional anesthesia (USRA) techniques, relevant to their practice.

Jeremy Bentham was the founder of utilitarianism and, although the "greatest good for the greatest number" has limitations in medical ethics, the premise of teaching fewer basic blocks to more learners rather than teaching all described blocks to a few, has recently been suggested and follows sound reasoning.<sup>1</sup> However, there is still a need for those who can perform a wider variety of more advanced techniques.

Regional anesthesia has seen significant changes in recent years, and the American Society of Regional Anesthesia and Pain Medicine (ASRA) now has more than 5,000 members worldwide, making it one of anesthesia's largest subspecialty organizations.<sup>2</sup> The

use of ultrasound has transformed regional anesthesia and has become the default technique for localizing nerves and fascial planes alike.<sup>3</sup> It is unlikely that future learners will gain meaningful exposure to nerve stimulation and paresthesia-based techniques as a first-line method of nerve localization. USRA has drastically increased the complexity and choice of available approaches, resulting in a tremendous number of novel blocks being described.

There are many opportunities for learning in regional anesthesia beyond residency programs, including clinical



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fellowships, masters-level qualifications, diplomas, workshops, and conferences.<sup>4,5</sup> Among the authors, all of the aforementioned have been completed; however, a clinical fellowship is arguably the most comprehensive and clinically useful. In this article, we will describe

some of the key benefits of fellowship training in regional anesthesia; however, we are aware that not everyone can do a regional fellowship – nor should they.

*"Fellowship training is a worthwhile undertaking that can lead to career opportunities, improved professional satisfaction, and an enhanced and lasting interest in regional anesthesia and acute pain medicine."*

## WHAT ARE THE BENEFITS OF A REGIONAL ANESTHESIA FELLOWSHIP?

As mentioned earlier, all anesthesia practitioners should aim to be able to perform the nerve blocks that are relevant to their practice, as well as a group of core blocks that would be generally useful.

Comparing regional anesthesia and acute pain medicine (RAAPM) to other anesthesiology subspecialties, such as cardiac or pediatric anesthesiology, helps to demonstrate the usefulness of fellowship training in this area. It would be expected that every anesthesiologist should be comfortable providing care to a patient with New York

Heart Association (NYHA) class II or III heart failure; however, anesthesia for major cardiac surgery in an adult with complex congenital cardiac abnormalities would likely only be undertaken by an expert with additional subspecialty training and experience. Likewise, most would be comfortable delivering anesthesia to a healthy 10-year-old for a minor procedure, but a tracheoesophageal fistula repair in a very low birth weight neonate may necessitate an experienced pediatric anesthesiologist. If this analogy is extended to RAAPM training then most, if not all, should be comfortable performing an ultrasound-guided popliteal sciatic block for a straightforward ankle fracture. However, if a patient required surgery under nerve block alone, or if more advanced techniques such as a sacral plexus block or a continuous catheter insertion are required, then input may be desirable from someone with more advanced training.

There are additional benefits to fellowship training, and some of these are described in Table 1. Although some of these are obvious, such as improving technical skills

by performing numerous ultrasound-guided blocks in a condensed period, some are less obvious.

One benefit of a RAAPM fellowship that is useful in practice is learning how to teach USRA. This is a very different skill than performing a nerve block, but no less valuable. Other non-technical factors, such as expanding your professional network and embracing academic opportunities, cannot be overstated.

Fellowship training is a worthwhile undertaking that can lead to career opportunities, improved professional satisfaction, and an enhanced and lasting interest in RAAPM.<sup>6</sup>

**WHAT IS THE ROLE OF THE FELLOWSHIP TRAINED REGIONAL ANESTHESIOLOGIST WITHIN THE PERIOPERATIVE TEAM?**

The role of the anesthesiologist has expanded significantly, and perioperative expertise is now routinely delivered from preoperative assessment clinics to postoperative acute pain rounds and beyond. Most fellowship opportunities

**Table 1:** *Benefits of RAAPM fellowship training.*

Area	Benefit
USRA	<ul style="list-style-type: none"><li>- Learning to perform a variety of USRA techniques</li><li>- Troubleshooting the imperfect block or catheter</li><li>- Learning from experts who regularly perform and teach USRA</li><li>- Managing complications including local anesthetic systemic toxicity and potential nerve injury</li></ul>
Non-technical	<ul style="list-style-type: none"><li>- Experience teaching USRA</li><li>- Follow-up to assess the patient experience</li><li>- Experience in leading acute pain rounds and team working</li><li>- Proficiency in the implementation and development of protocols</li><li>- Management skills in coordinating nerve blocks for different operating rooms</li></ul>
General	<ul style="list-style-type: none"><li>- Academic opportunities (eg, writing study protocols and conducting clinical research, publication in peer-reviewed journals, writing book chapters)</li><li>- Improved curriculum vitae, employment opportunities</li><li>- Opportunity to teach courses</li><li>- Life factors: meet new people, travel, and expand horizons</li><li>- Involvement in local, national, and international societies (eg, Northern Ireland Regional Anaesthesia Society, Regional Anaesthesia UK, European Society of Regional Anaesthesia and Pain Therapy, American Society of Regional Anesthesia and Pain Medicine)</li></ul>



in this area are now considered RAAPM and not solely “regional anesthesia.” The integration of regional anesthesia techniques within the entire acute pain journey is important.

The 2018-2019 report from the U.K. Perioperative Quality Improvement Programme (PQIP) shows that 7.5% of patients report severe pain in the post-anesthesia care unit (PACU) and this rises to almost 20% within 24 hours of surgery.<sup>7</sup> This report also cites “*Individualised Pain Management*” as one of the top five ongoing perioperative improvement opportunities. Those with fellowship training in RAAPM are ideally suited to work in and lead acute pain teams to provide the high standard of pain management that should be aspired to. This should ideally begin preoperatively by managing patient expectations and providing patient education and continue through to postoperative care.

Not all acute pain is perioperative, and most acute pain teams now provide USRA to patients with injuries such as rib fractures and proximal femoral fractures and for procedures such as reduction of a dislocated shoulder.<sup>8</sup> The RAAPM-trained fellow will have gained experience in the management of these cases and will have the confidence and ability to utilize USRA to improve the patient experience through safe, and potentially protocolized, incorporation of regional techniques into multimodal analgesic regimes.

Arguably, the main virtue of a RAAPM fellowship is the management and follow-up of a high volume of patients undergoing surgery who have pre-existing chronic pain issues and thus require expert care and attention in the perioperative period. This experience and learning go beyond the ability to perform USRA techniques and imbue the anesthesiologist with a depth and breadth of knowledge and proficiency that allows the correct techniques to be used in a well-informed patient.

## CONCLUSIONS

Completing a RAAPM fellowship is worthwhile; however,

for personal and professional reasons, not everyone will be able to spend the additional time or travel required for these opportunities. This places a responsibility on RAAPM fellowship-trained anesthesiologists to share newfound skills, techniques, and network opportunities within their department, consequently affording more patients better access to USRA.

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# The Beauty of Diversity in Medicine

The year 2020 has changed the fabric of society, compelling us to look within ourselves regarding what we value, what we believe, and how we treat each other. Most of this article was written prior to the deaths of Breonna Taylor, George Floyd, and others at the hands of police violence. Their deaths and the revolution that has followed bring into sharper focus the disparities in health care representation and delivery that exist within our society. This article does not remotely cover the scope of the relationship of race inequality and injustice, but we hope to address why diversity within medicine is so vital.

Despite a tumultuous beginning to the year, the 2020-2021 Residency Match season will begin soon. Historically, department leadership focused on grades, scores, and recommendation letters, but do “objective” measurements necessarily equate to the best candidate? As the population in the United States continues to grow and diversify, the medical field faces the task of following suit, providing both access to and representation of the general population. More importantly, those in medicine should actively combat racial inequality for the benefit of all.

*“It is not enough to be impartial; the active promotion of minorities in medicine is of vital importance.”*

## THE CURRENT STATE OF UNDER-REPRESENTED MINORITIES IN MEDICINE

Minority underrepresentation is present at all levels of medical training, from medical school to residency, and even beyond into practice and leadership positions. Minority underrepresentation has actually increased since 2002; while the total number of minority medical students has increased since then, it did so at a lower rate than their age-matched counterparts in the population.<sup>1</sup> This in turn translates to decreased representation at a faculty level (Figure 1). Data collected in 2015 by the Association of American Medical Colleges (AAMC) showed that, while there was an increasing percent of female faculty (39%), only 4% of faculty members were both female and identified as a minority<sup>2</sup> (Figure 2).

While minorities are underrepresented in medicine in general, some specialties struggle more to attract



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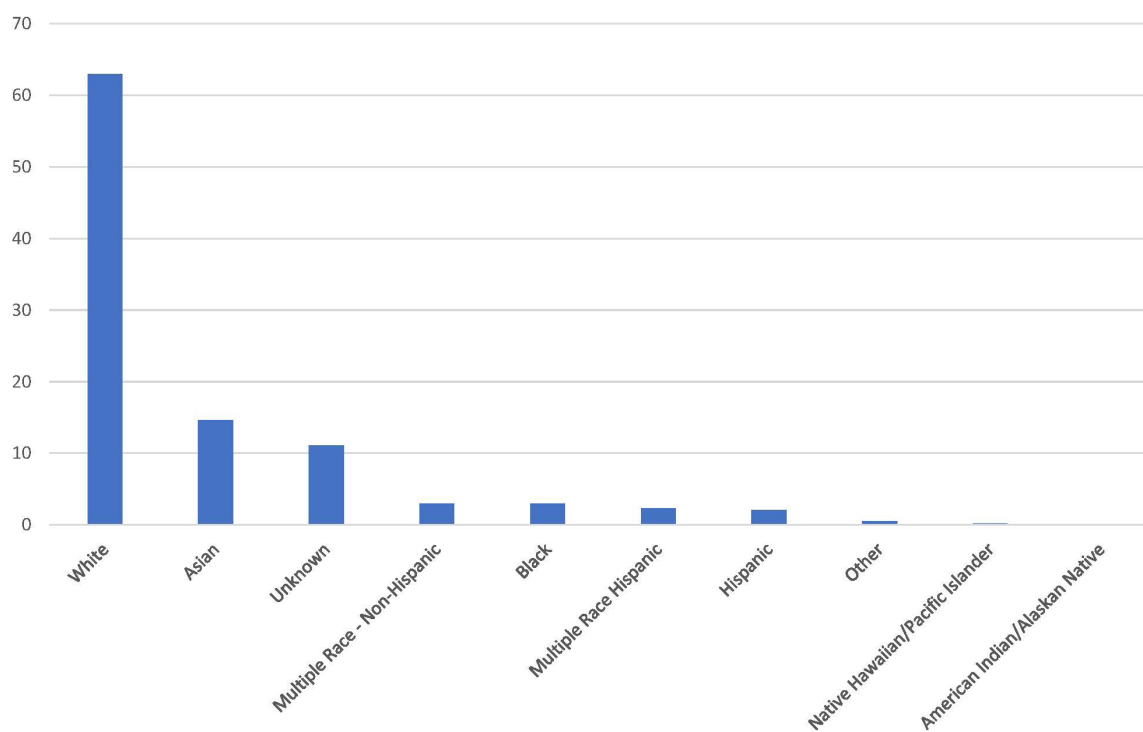


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minorities and women. Medical specialties show a little more than 25% under-represented minorities (URM), while in surgical subspecialties, URM representation drops to about 20% with the field of urology experiencing the lowest rate of URM representation at 17.7%.<sup>3</sup> The reasons are varied and often multifactorial, but decreased exposure to a specialty in medical school, limited research and shadowing opportunities, and a lack of mentors play a role in preventing both female and URM consideration of a field.<sup>4</sup> Even in the seven medical subspecialties that boasted a female majority in 2012, URM representation lagged far behind the general

**Figure 1:** *Percentage of full-time U.S. medical school faculty by race and ethnicity.<sup>1</sup>*



population with radiology, orthopedic surgery, and otolaryngology struggling the most.<sup>5</sup>

The field of anesthesiology has seen a surge in female anesthesiologists but still falls short of the female representation in the general medical workforce.<sup>6</sup> Both women and URM lag in leadership positions compared to both representation in the physician workforce and the general population as can be witnessed in the leadership of the American Society of Anesthesiologists (ASA).<sup>7</sup> A major barrier for the field of anesthesiology is the lack of exposure during medical school; anesthesiology is not required as part of the core curriculum and as a “hidden” specialty is not a commonly chosen elective.

## OBSTACLES AND BARRIERS

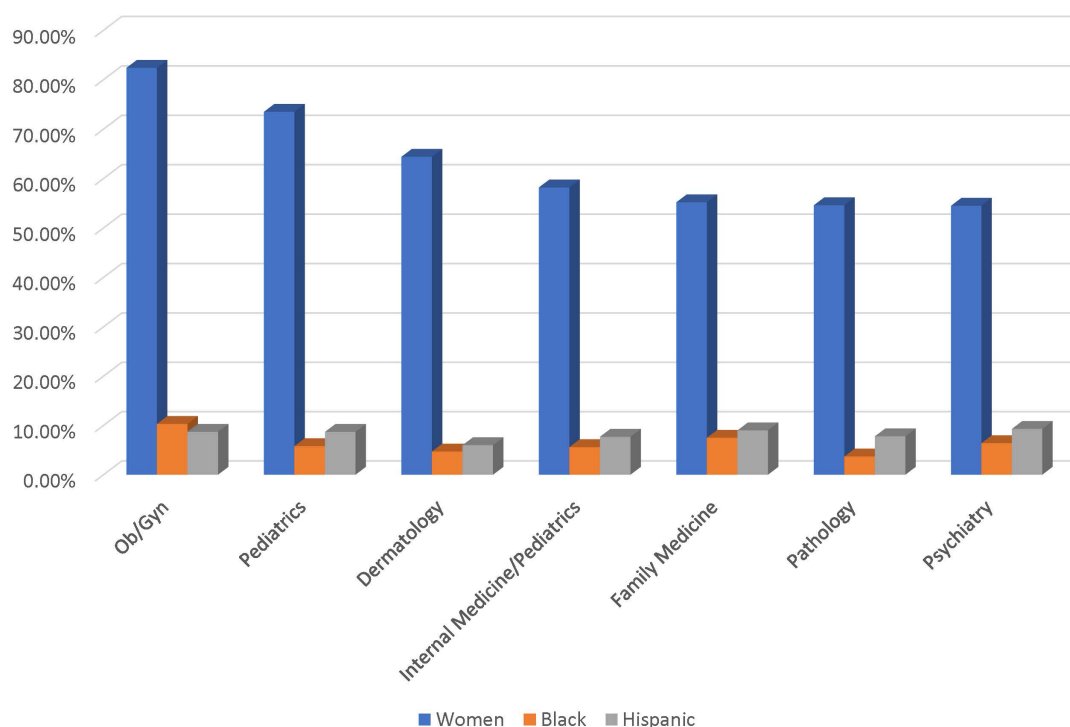
Appreciating the trials of minority members in the medical field requires understanding of the common barriers that can act as active hindrances or lead to estrangement, decreasing team cohesiveness. A 2018 study queried residents from 21 different programs across the country and found several common elements in their experiences. The top three themes that they discovered included microaggression and bias, being tasked as minority ambassadors, and difficulty defining a professional and personal identity.<sup>8</sup>

**Bias.** Implicit bias, defined as unconscious attitudes and stereotypes that all members in a population hold and which may or may not affect their behavior to others, becomes problematic in medicine because it affects medical decision making or patient perception of a caregiver.

Although they are not the exception, URM and women experience both implicit bias and microaggression at a higher rate and face questions and assumptions about training, abilities, traditional roles, background, and cultural differences. This is a pervasive and constant reminder that these groups of people are different and separate. Kaplan et al found that some residents report being constantly mistaken for one of the few other minorities in their program by their own staff which indicates that though they are separate from the majority, they are interchangeable with each other.

**Mentorship and Identity.** URM were retained at a lower rate in academic institutions compared to white colleagues; they were published and promoted less frequently as well.<sup>9</sup> Lack of mentorship is a potential reason; similar backgrounds are not required to provide career and educational guidance for a URM medical

**Figure 2:** *Medical subspecialties with female majority with corresponding underrepresented minority representation.*<sup>5</sup>



student, resident, or faculty member, but having similar backgrounds can be beneficial in the navigation of common barriers in the professional environment.

URM populations struggle to assimilate into their workplace while maintaining a sense of individual and cultural identity, which can lead to a mismatch between personal and professional identities.

**Minority Tasking.** In the medical world, minority groups are commonly expected to bear the burden of recruiting their own. In places where diversity is not prevalent, this task falls to a few individuals, adding to their already heavy workloads and potentially limiting opportunities that might lead to promotion. Minority tasking unfairly distributes burden to URM and women what should be shared with many: recruitment, education, curriculum development, and mentorship.

## BENEFITS OF DIVERSITY

**Financial.** Many industries have recognized the lack of minorities in their ranks and the benefits of diversifying their workforce. In the banking industry, growth firms with greater racial diversity were shown to have higher productivity and increased return on equity.<sup>10</sup> Another

study looking at gender diversity within service and manufacturing organizations found a positive linear relationship between employee productivity and greater gender diversity, with productivity increasing by \$38,824 for every 5-point increase in Blau's index (an index of group diversity).<sup>11</sup> Medicine is unlike any other industry; while monetary gains can serve as incentive, providing better patient care, access, and representation, as well as improving physician satisfaction, are the real goals for increasing diversity in medicine.

**Access and Representation.** It has been well documented that health care disparities exist within our country; URM and women can and do positively impact population health. The infant and maternal mortality rate for African-American (AA) and Native-American (NA) women is 2 to 3 times higher than for white women and the highest for a developed nation.<sup>12,13</sup> HIV infection rates are higher in the AA, Hispanic, and NA populations, and African Americans and Native Americans have much higher rates of diabetes, hypertension, and stroke than their white counterparts.<sup>14,15</sup>

Coupled with poorer health in minority populations is the finding that minorities are more likely to get lower valued healthcare and less likely to be referred to specialists

for time-sensitive surgeries along with diagnostic and therapeutic procedures. African Americans suffer higher rates of amputations with fewer revascularizations than their white counterparts. Provider bias contributes, in part, to this unequal distribution of medical care.<sup>16</sup>

A study found that women account for 50.8% of the U.S. population but only 35.2% of practicing U.S. physicians.<sup>17</sup> The same study documented that URM and women physicians tend to practice more often in underserved communities and provide care for poorer populations. Minorities patients also were found to receive Medicaid at a higher rate than their white male colleagues even when adjusting for socioeconomic status.<sup>17</sup>

Despite having fewer numbers, female physicians are more likely to care for women and patients with complex psychosocial issues while also providing patients with more preventive care and counseling. Patients of female physicians were more likely to survive a myocardial infarction and had lower hospital readmission rates.<sup>16</sup>

Patients tend to select physicians who resemble them and are more satisfied with care from these physicians.<sup>16</sup> When AA male patients were seen by a racially concordant physician, they were more likely to participate in and adhere to the preventative strategies their physicians prescribed, which could lead to better health.<sup>18</sup> Given that minority communities receive lower quality healthcare more frequently, increasing the population of URM and women physicians to combat the issue of access to care will help to improve the population health of minority patients. This is especially critical given that by 2050, half of the US population will identify as non-white minorities.<sup>19</sup>

**Physician Satisfaction.** Burnout among physicians has been called a growing public crisis. According to an article published by the Mayo Clinic, nearly 54% of practicing physicians experience symptoms of burnout.<sup>20</sup> In addition, 10.5% of these physicians reported a major medical error within the prior three-month period, and 3.9% had a failing patient safety grade.<sup>20</sup> Not only does the individual physician suffer lower productivity, career dissatisfaction, and suicidal ideation, but patients experience poorer quality of care. Burnout has negative consequences for patients when experienced by resident physicians as well attending physicians. In a study published by JAMA, 55.2% of residents experienced symptoms of burnout and had greater implicit and explicit racial biases.<sup>21</sup>

URM physicians, particularly Hispanic physicians, experience lower stress and higher career satisfaction

compared to their white colleagues.<sup>16</sup> Increasing the pool of URM physicians may positively contribute to decreased rates of burnout. Also, increasing the pool of URM residents decreases the risk of depression for URM residents and non-URM residents in the program.<sup>22</sup> By diversifying the physician workforce, we have the potential to provide not just more access to care, but better quality of care for our nation as a whole.

## GOALS AND PLANS FOR IMPROVING DIVERSITY

Promoting diversity is a multifactorial and active process that requires the support of leadership as well as early exposure, encouragement, and mentorship. While increasing female and URM representation within a department, institution, and medicine as a whole may seem like a daunting task, there are success stories. Auseon et al describe improved URM recruiting to the Ohio State University Cardiology Fellowship via prioritization of current URM fellows, forming a subcommittee to focus on URM candidates, reaching out to diverse residency programs, and adjusting the agenda of the interview day to focus on mentorship, among other methods.<sup>23</sup> The study did highlight the importance of both URM faculty and guest speakers to exemplify commitment to URM support and promotion.

Although not a medical specialty, the methods and results from Carmichael et al's study to increase URM undergraduate student success in science, technology, engineering, and math (STEM) courses could apply to advancing URM and women in medicine.<sup>24</sup> The study focused on understanding the needs of students and used a multi-tiered approach to teaching including use of a resource center, advising, academic success office, and peer tutoring. The investigators worked to identify barriers and obstacles for high-risk students, including isolation and uncertainty, inadequate time management and study skills, and needing to work while in school to provide more well-rounded support to their students. It emphasized data driven, systematic interventions to encourage more active participation by faculty and support staff to increase the success of students.

**Combating Myths and Affecting Strategy.** Improving strategy for both recruitment and retention of URM and women in medicine requires first the changing of the existing mindset toward diversity in the field. Diversity is often seen in opposition to meritocracy, and it is believed that the real problem lies in the pipeline itself, limiting both female and URM candidates because of low numbers in the first place, as well as family planning and lifestyle



priorities.<sup>25</sup> Medical schools currently boast higher numbers of women than men, and the most commonly cited reason for avoiding certain specialties is lack of mentorship and representation. Both women and URM are bypassed secondary to bias rather than lack of merit for positions.

Strategies to improve URM and women recruitment and retention include changing the culture of the organization, training leaders, and using targeted recruitment strategies focusing on both URM and women.

**Leadership.** Leadership support is paramount to the success of both the recruitment and retention of women and URM within a department. Both populations face challenges that their male and non-URM colleagues do not; implicit and explicit bias, family planning, lack of mentorship, and cultural differences, as well as the burden of representation, can quickly lead to burnout. “Program leadership should note that workplace bias is likely underrecognized by institutions” (p. 8).<sup>8</sup> This is the first step to providing an environment that ensures the success of URM and women within a department.

## EARLY SUPPORT FOR URM/WOMEN

Recruitment is not enough, institutions benefit from focusing on efforts surrounding retention. Early support of employees is crucial to establish prioritization of diversity; new employee orientations should include education and support of diversity and provide a socialization process to reduce bias. “Multicultural organizations need new employee diversity orientation programs that create a two-way socialization process ensuring that (1) bias is reduced and (2) minority perspectives influence organizational norms and values” (p.173).<sup>26</sup>

Continued support for URM and women in medicine is required; the path to promotion is paved by opportunities to research and network. “Regional and national initiatives to promote networking, education and professional development may connect URM and female students, residents and practicing [faculty], thereby fostering mentorship opportunities and supportive communities” (p. 5).<sup>4</sup> In doing this, institutions provide an avenue and the laid groundwork for residents and faculty to succeed with the help of those who have shared their path.

## CONCLUSION

While the current state of diversity in medicine is disheartening, more institutions and departments realize the benefits of diversifying the physician workforce. It is not enough to be impartial; the active promotion

of minorities in medicine is of vital importance. The first steps include accepting that lack of diversity is problematic and changing the culture and bias within a department. Though it is difficult to avoid implicit bias given its pervasiveness, active vigilance, self-assessment, and de-biasing activities can limit the role of implicit bias in medicine. Increasing the presence of women and URM within medicine will take active participation, early and continued support, and vigilance for bias. Though the road ahead is long, the potential rewards of a more equitable workforce are great and include improved physician satisfaction, improved patient care, greater representation of the national population, and a step toward equality in our society.

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# Leadership Qualities: What Makes a Great Leader?

When my chairman of 15 years announced at a faculty meeting that he would be stepping down as chair, the room went silent. If you knew our verbose, lively, passionate, and communicative department, you might better understand how profound this was. We are never silent. He went on to clarify: WE are the department, he merely had the word "Chair" by his name on the faculty roster... WE would always be the department, no matter who led it... he didn't worry about our stability or trajectory because we are a strong and cohesive group of 62 capable physicians with a history of perseverance and success. While these things were mostly true (he was/is much more than a faculty member with "Chair" written by his name), I was still left with a sense of disorientation and inquisition about what I would most miss about our leader and who we would be without him. What made him such a beloved leader, and how could we replace him?

The Merriam-Webster dictionary defines LEADER as a powerful person who controls or influences what other people do; a person who leads a group, organization, country, etc. Words like "powerful," "control," and "influence" were not the descriptors I was seeking. As I continued to try to write about and define leadership, it began with a literature search. What do the data show? Is there evidence of what makes an effective leader?

While defining "leader" may be a challenge, identifying when someone is or isn't an effective leader is much easier. Within the specialty of anesthesiology, what helps leaders in regional anesthesiology and pain divisions succeed? Is there a prototype of a best leadership style? How can a leader unite a department and foster respect and collegiality between so many different personalities both within and outside the department? While there are hundreds of different leadership types and descriptions, one inclusive list defined nine different leadership types<sup>1</sup> (Figure 1).

*Transformational* leaders are frequently defined as leaders who inspire and encourage others to create the changes needed to progress and grow. They are motivators of others. *Transactional* leaders tend to provide more organization and supervision and use rewards as a motivator. *Servant* leadership focuses on the premise that leaders serve others and embody empathy, listening, stewardship, and building community. *Autocratic*

leadership, or authoritarian leadership, involves the leader making decisions based on their own ideals with little input from others. *Democratic* leadership, also termed participative leadership, involves group participation in decision-making.

*Bureaucratic* leadership is based upon administrative needs of organizations with rules and clear definitions of authority. In contrast, *laissez-faire* leadership is a hands-off style of leading. *Charismatic* leadership is a trait-based leadership theory that emphasizes the leader's personality and ability to influence and inspire others. Finally, *situational* leadership refers to leaders that can adapt and use different leadership styles based on the environment in which they are working.

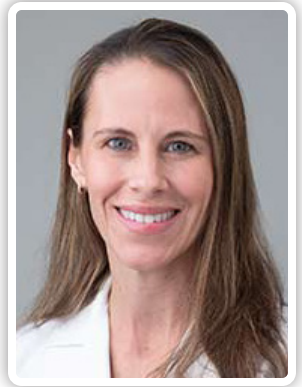
Although many leaders embody multiple leadership styles, are there salient and specific characteristics that

create the most proficient leaders? And if so, how do we, as individuals, refine and improve these in ourselves? A study of more than 75,000 people spanning 11 years and 6 continents identified four adjectives as the most important characteristics in a leader they are willing to follow: honest, forward-looking, competent, and

inspiring.<sup>2</sup> While a leadership course may teach managerial skills and vision creation, how do we embody and grow into these or other characteristics that make us great leaders?

An excerpt from Scemama and Hull's *Anesthesiology* article entitled "Developing Leaders in Anesthesiology: A Practical Framework" gives hope that there is no specific mold for leadership and that leadership can be fostered in each of us.<sup>3</sup>

Recent research into high-performing organizations has shown a consistent shift away from top-down



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*"While defining 'leader' may be a challenge, identifying when someone is or isn't an effective leader is much easier."*

**Table 1:** *Nine styles of leadership.*<sup>1</sup>

Leadership Style	Primary Characteristic(s)
Transformational	Inspires and encourages others to create the changes needed to progress and grow; motivates others
Transactional	Provides more organizational and supervisory support and uses rewards as a motivator
Servant	Focuses on the premise that leaders serve others and embody empathy, listening, stewardship, and building community
Autocratic/authoritarian	Makes decisions based on their own ideals with little input from others
Democratic/participative	Involves group participation in decision-making
Bureaucratic	Leads based on administrative needs of organizations with rules and clear definitions of authority
Laissez-faire	Employs a “hands-off” style of leading
Charismatic	Emphasizes personality and ability to influence and inspire
Situational	Adapts and uses different leadership styles based on the environment

authoritarian environments toward leadership cultures where everyone, at all levels, is required to be a role model and an agent of change. No longer will it suffice for a clinical leader to wait until he or she has been promoted to a formal position of power to start developing leadership skills. Leadership exists as a potential within everyone: male or female, junior or senior, titular boss or underling. In fact, there is now considerable evidence that effective leaders are not always grand visionaries but are just as likely to be humble, self-effacing, emotionally stable, diligent and resolute, and that leadership is needed at every level of an organization [pp. 652-3].

The question then becomes not *can* we become a leader, but, are we *willing* to be a leader.

Brene Browne, a social psychologist and professor at the University of Houston, has redefined leadership after a seven-year study with the intention of creating identifiable and measurable qualities in leaders. Her 2018 book, *Dare to Lead*, defines a leader as “anyone who takes responsibility for finding the potential in people and processes and has the courage to develop that potential” [p. 4].<sup>4</sup> She describes four pillars of

courageous leadership: 1) rumbling with vulnerability, 2) clarity and living into our values, 3) braving trust, and 4) learning to rise. As defined by Browne, courage is “less about who people are and more about how they behave and show up in difficult situations” [p. 11].

Vulnerability, emotional exposure, uncertainty, and risk are critical in leadership. Leaders must be willing to take risks and be vulnerable, and they also must provide an environment where their team can *be* vulnerable. Providing an environment where others feel safe, respected, and free from discrimination and judgement is critical for a leader. This allows team members to take risks and remain motivated to participate. With that, identifying clearly defined values that define individuals and organizations is necessary. Values guide us and help us deal with adversity.

Within our specialty of medicine and anesthesiology, we are lucky to have the Hippocratic Oath to bond us in our mission and values: “I will remember that I remain a member of society, with special obligations to all my fellow human beings, those sound of mind and body as well as the infirm.” Despite this, physicians are often faced with conflicting pressures and demands.

Choosing the most important values (ie, quality of care, patient safety, and education) can guide leaders and organizations, and it can also be translated into behaviors.

Trust, which is Browne's third pillar of leadership, is the fundamental component of connection. Browne defines specific behaviors of trust that are measurable. She calls these seven elements of trust "BRAVING", which stands for: Boundaries; Reliability; Accountability; Values; Integrity; Nonjudgement; and Generosity.

Finally, Browne's fourth pillar, "learning to rise," describes resiliency and the potential to manage failure and persevere. Her message is a powerful roadmap of redefining leadership in the workplace by daring greatly.

Like Brown, Scemama and Hull define major themes of leadership and the need to break out of unproductive beliefs and learn new behaviors in "Developing Leaders in Anesthesiology: A Practical Framework."<sup>3</sup> The three themes include 1) self-awareness, 2) creativity, and 3) relationships. They describe the significance of leadership and self-awareness and the need to exhibit emotional intelligence. This includes bridging the gap between how we perceive ourselves and how others perceive us. This also involves being receptive to feedback. After self-awareness is present, the authors note that to affect change, the next critical step is creativity, defined as "the willingness to experiment, to break through barriers in relating to others, and to be open to innovate ideas" (p. 654). Not only do leaders need to generate creative ideas, but they need to nurture the original and creative ideas of others. Finally, the authors note the importance of leaders engaging in high-quality relationships. The authors note that trust is a fundamental and integral component of successful leadership.

Mets writes about "Leadership Challenges in Academic Anesthesiology" with a focus on shared values and a departmental mission of education, research, and patient care.<sup>5</sup> Accompanying values is the need for individuals to embrace a strategy and commitment. The premise of leadership being about relationships and occurring at multiple levels echoes many of the same ideals as Browne. Souba noted that effective leaders do the following:

1. Listen to the environment and people.
2. Exemplify and embody core values.
3. Applaud others.
4. Deal with problems.

5. Empower, enable, and inspire others.
6. Seek results.
7. Serve others.

These seven characteristics form the mnemonic: LEADERS.<sup>6</sup> This creates a framework in which to act with the intention of being an effective leader.

How do anesthesiologists within our specialty define values and act as leaders? Dr. Edward R. Mariano, a leader in the field of regional anesthesia (who also generously shares and leads through social media) presented a short list of learned lessons on leadership on his blog post entitled "To the Next Generation of Physician Leaders."<sup>7</sup> These include:

1. Be a good doctor.
2. Define your identity.
3. Consider the big picture.
4. Promote positive change.
5. Be open to opportunities.
6. Thank your team.

Mariano emphasizes many of the same ideals of being open to new ideas, taking risks, crediting and involving others. In another blog post, "Tips for Future Physician Leaders," he wrote, "In healthcare, a leader should set a good example of professionalism in clinical care, communications, and administrative work. A leader creates a shared vision for the group with a clear direction and celebration of the group's accomplishments. A leader first invests in his or her staff members to develop them individually so their greater potential can benefit the group. A leader is inspired by his or her staff and is constantly listening and learning."<sup>8</sup>

Dr. Jennifer Szerb, an anesthesiology professor in Halifax, Canada, describes trying 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."<sup>9</sup>

Another leader in the field of anesthesiology, Dr. Joseph Neal, nicely summarized, "Those with the most professional satisfaction seem to derive great pleasure from taking good care of the people they exist for—their patients or trainees at work and their family at home. There is interest and motivation to stay involved in something beyond just themselves ..."<sup>10</sup>

Ultimately, what I found and want to share is NOT "A guide to becoming the next departmental chair or division head." What I learned is this: there is no one right kind of leader.



And, leaders are needed everywhere, at every level of medicine. We are all leaders, *need* to be leaders, and have the potential to become *better* leaders. Despite effective leaders taking so many different forms, leaders who place emphasis on creating and living out solid values and doing so with emotional intelligence, openness, and prioritizing relationships prevail. This is true regardless of who is leading or what they are leading.

An anesthesiologist leader is nothing without a connection to the people around him or her, and every encounter provides an opportunity to lead. Whether guiding an operating room through an uneventful surgery, teaching medical students the basics of endotracheal intubation, or overseeing a prolific pain clinic, there are daily opportunities for self-reflection, betterment, and growth as a leader.

*"The world is moved along, not only by the mighty shoves of heroes, but also by the aggregate of the tiny pushes of each honest worker."*

— Helen Keller

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# Physician Mentorship and Leadership Development Special Interest Group

**Mentor:** noun

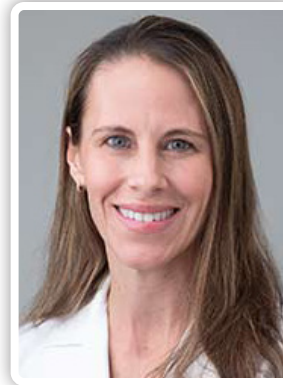
1. a wise and trusted counselor or teacher
2. an influential senior sponsor or supporter<sup>1</sup>

To be one or to have one... are both invaluable gifts.

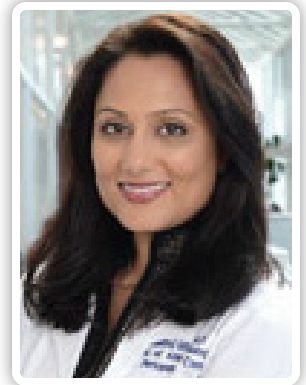
The first mentorship can be found in Greek mythology when Homer's Odysseus left his teenage son in the care of Mentor when he left for the Trojan War.<sup>2</sup> The first recorded modern usage of the term "mentor" is traced to a 1699 book entitled *Les Aventures de Télémaque*, by the French writer François Fénelon with the lead character Mentor.<sup>3</sup> Since then, the concept of mentorship has become an integral part of many professions, with medicine embracing the concept of mentoring throughout all levels of training and development. Despite this, in some medical subspecialties, fewer than 20% of faculty members were able to identify a professional mentor.<sup>4</sup> Similar findings were demonstrated in anesthesia trainees in the United Kingdom where only 20% could identify a mentor, while 70% noted they would have benefited from a mentor-mentee relationship.<sup>5</sup>

A review of the literature, spanning from 1996-2002 found 162 publications on mentoring programs with 16 meeting methodological criteria. The studies were largely qualitative and although positive satisfaction of mentoring programs was demonstrated, none included any guidance on the effectiveness of the mentoring programs.<sup>6</sup> A more recent systematic review of 42 studies examined the prevalence of mentorship for medical students and physicians and its impact on career development.<sup>4</sup> They determined that mentoring is considered an integral component of academic medicine and can be influential in career choice and guidance, research and grant success, and professional success. The presence of a mentor may not only influence career preference, but also whether a trainee embarks on a career in academic medicine.<sup>7,8</sup> Mentoring is noted to be impactful in not only career selection but also advancement, productivity, and successful promotion.<sup>4,9,10</sup> Other studies have shown performance improvement and increased self-assessed confidence in mentored physicians both clinically and academically.<sup>11,12</sup>

*"Our goal is to create lasting partnerships that benefit both the mentors and mentees through structured activities and interactions."*



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There is a gender difference in terms of mentorship, as shown in a study from University of California San Francisco where 22% of women junior faculty and 21% of housestaff women had never had a professional mentor, compared to only 9% of men faculty and 16.5% of housestaff men. Notably, 24% of women noted the lack of a mentor as one of the two most negative career experiences.<sup>13</sup>

A qualitative study on mentor-mentee relationships in academic medicine noted that all participants believe good mentorship is vital to career success.<sup>14</sup> Strategies to enhance mentorship include formalizing mentorship initiatives, organized and

supported workshops, and constructive feedback by both mentors and mentees. The characteristics of a good mentor should not be overlooked and include seniority, approachability, accessibility, altruism, understanding, patience, and honesty.<sup>14</sup>

## MISSION OF THE PHYSICIAN MENTORSHIP AND LEADERSHIP DEVELOPMENT SIG

With this information and affirmation of the importance of mentoring, why is it not more formalized in our

## BE A MENTOR!

ASRA's new Mentoring Program is looking for volunteers who will offer their expertise and wisdom.

We will match mentors and mentees carefully based on common interests and personal + professional needs and strengths.

Become a mentor today!

subspecialty? An ASRA Physician Mentorship and Leadership Development (or PMLD) Special Interest Group (SIG) was created to foster leadership skills in each of us and provide the infrastructure, through mentorship, to guide members in personal and professional growth.

While members of ASRA have many diverse interests including chronic pain, regional anesthesia, pediatric pain management, point-of-care ultrasound, etc, we all share basic fundamental tenants. Rising to our best professional and personal selves, while being championed and supported by others, are universal needs. We need to be strong leaders but also step in line and provide support when others are leading. Further, finding our person or people to support, inspire and guide us throughout our journey is immeasurable. Whether we call that person a teacher, a mentor, a sponsor, or simply a supportive colleague, to have someone invest in us and our personal growth objectively benefits us professionally and personally.

The mission of the Physician Mentorship and Leadership Development Special Interest Group is to increase the pool of physician leaders interested in regional anesthesia and pain management through leadership training and a strong mentorship commitment that matches faculty from different institutions. Our hope is to foster an environment of mutually beneficial career advancement.

To accomplish the shared missions of ASRA and the Physician Mentorship and Leadership Development SIG, we propose these specific goals.

- Provide mentorship opportunities for physicians at all

stages of their careers with a special focus on mid-career physicians, as traditional mentorship programs often bridge early career physicians with senior faculty leaving a "mentorship gap" for this group.

- Cultivate relationships, increase career opportunities, and provide connections that will foster academic development and promotion.
- Increase the pool of physician leaders with an interest in regional anesthesia and pain management.
- Increase the pool of physician leaders able to represent ASRA outside of the organization.
- Cultivate physician leadership skills that will assist ASRA members throughout their careers.

ASRA has a professional and ethical commitment to ensuring all faculty have awareness of and opportunity for the attainment of leadership positions that foster career growth. The SIG will support the Board's commitment to building society member leadership opportunities, ensuring there are positions and representatives from all career levels, and assisting with developing advertisement and solicitations for positions and mentorship for those serving in new roles. The SIG also may make recommendations for the standardization of processes regarding candidate selection and review.

Collaborating with ASRA Connect and the ASRA Membership Committee, we will soon launch the **Mentor Match** program. This program will pair mentors and mentees across the country based on professional and personal needs. Our goal is to create lasting partnerships that benefit both the mentors and mentees through

structured activities and interactions. This mentorship structure is designed to be particularly helpful for faculty at institutions lacking senior faculty available to provide career guidance. In addition, structured mentoring would be intended to produce opportunities for under-represented groups. This structured mentorship program will help foster personal leadership skills and development, while providing opportunities for collaboration, guidance, and, ultimately, promotion and career advancement. The first step in the project is to enlist volunteer mentors.

*"The greatest good you can do for another is not just to share your riches but to reveal to him his own."*

— Benjamin Disraeli

We recognize that mentorship can be acquired through many different frameworks and needs—what may be relevant to a junior physician may not necessarily be applicable to a mid-career faculty's development. Moreover, those who are eager to launch a research career have a different trajectory and needed skill set compared to those interested in the administrative and operational aspects of healthcare. The SIG aims to enhance the development of the "soft skill set" that, frankly, can be applicable to all ASRA physicians regardless of seniority (ie, presentation skills, designing clinical trials, budgeting, feedback, critical literature review) but also serves to provide a more structured approach to those with specific needs based on one's level of seniority and goals.

The SIG plans to enrich leadership abilities with podcasts, videos, and tutorials on a variety of topics and by utilizing the incredible pool of talent that is already present within the organization. We also recognize the need to reach across disciplines and leverage ASRA's relationships outside of the physician community into management science. Focus will be placed on understanding qualities of strong leaders and teaching leadership skills to support personal growth as leaders.

We look forward to forming a strong group of interested ASRA members, seeking out members willing to mentor and those in need of mentorship, and fostering leadership skills in each of us.

*"Before you are a leader, success is all about growing yourself. When you become a leader, success is all about growing others."*

— Jack Welch

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# What Showing Up Can Do for You



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## ATTENDING AN ASRA CONFERENCE, WHAT SHOWING UP CAN DO FOR YOU: A RESIDENT'S PERSPECTIVE

During the opening of ASRA's 18<sup>th</sup> Annual Pain Medicine Meeting this past November in New Orleans, President Eugene Viscusi, MD, stated, "Eighty percent of success is just showing up." I'd like to tell my fellow residents as well as any medical students reading this article just what "showing up" can accomplish.

As an early 2<sup>nd</sup> year resident physician (referred to as CA-1 in the anesthesiology community), I held only a fledgling understanding of the practice of anesthesiology and a still smaller grasp of acute and chronic pain management. At the urging of a senior resident, I registered, booked a flight and hotel, and showed up.

With membership recently exceeding 5,000 physicians, residents, nurse practitioners, physician assistants, and beyond,<sup>1</sup> ASRA provides an invaluable source of education, mentoring, and professional opportunities. For a medical student or resident, there are no prerequisites to attend a conference or become involved in the society.

My personal involvement began at the 17<sup>th</sup> Annual Pain Medicine Meeting held in November 2018 in San Antonio, TX. While being warmly greeted at the registration desk, I noticed a sign offering a networking dinner called "ASRA Let's Eat"; I signed up. An ultrasound anatomy course geared towards residents and fellows was being offered; I signed up. The conference agenda listed multiple special-interest group (SIG) meetings throughout the weekend. A Medical Student/Resident Education SIG stood out to me; I showed up. Near the closure of the meeting, the Resident/Fellow Meet and Greet was held. In a single room, there were more than 50 acute and chronic pain management fellowship program directors; though not a social setting I generally thrive in, I showed up. Each of these events resulted in social and professional connections to various students, residents, fellows, and attendings.

One year later, I returned to the same meeting, this time in New Orleans. I looked forward to meeting up with

residency program alumni, friends from prior conferences, and society members I met via social media. After three short days of the conference and through other informal interactions, I had a number of physicians from across the country who I could comfortably refer to as mentors.

In addition to the social opportunities, I was able to attend lectures addressing a breadth of topics ranging from basic sciences, IV ketamine and lidocaine infusion management, opioid crisis management, development and advancement of neuromodulation, contract negotiation, and beyond. The education sessions have often served as my primary instruction on many of these topics, as they're not frequently brought up in base clinical education. While admittedly most were over my head during my first conference, they served as foundational knowledge.

I have personally found that there is no better conference and society to "show up" to than that of ASRA. So, please, join us. Get involved. There is much work to be done on behalf of the clinicians and patients that we care about.

— Drew Cornwell, DO

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## WHY SHOW UP? LESSONS LEARNED – AN ATTENDING'S PERSPECTIVE

To our Residents, Fellows, and Medical Students,

Do you have great memories from the ASRA Fall Meeting in New Orleans? Are you excited about a new colleague or a new project? Do you appreciate the incredible education and the opportunity to extend advocacy to your local environment? Are you inspired by the "voice" of our entire field of medicine? I have amazing memories from New Orleans, and I am naturally reminded of New Orleans in 2011, when I attended my very first ASRA Pain Medicine Meeting.



The personal-professional support and connections that are initiated and grow from the fall meeting result from proximate face-to-face human contact in such an incredible environment of scholarship, discourse, and discussion; such a combination is not available on any social media or other virtual venue. True mentorship means you can call someone across the country and seek invaluable external advice on any issue; it means knowing who to go to for trustable career advice, guidance, and scientific collaboration. Sponsorship goes beyond mentorship and includes public support by a more influential or powerful person to assist with the advancement of you in your career. It acknowledges

your untapped or underappreciated leadership potential and includes tangible invitations and opportunities to participate in career-advancing projects accompanied by direct public acknowledgement and support. Mentorship and sponsorship are incredible gifts we gain from meeting participation.

Showing up at the ASRA Fall Meeting annually also gifts you with remarkable insight on pain medicine. The voices and views you hear, and to which you contribute, could never be reproduced in a textbook as they are the product of this live, nutrient-rich meeting environment. You gain a national and international perspective on hot topics in medicine and on emerging ideas, you bring these ideas back to your home institution, and you take them with you on your own leadership and patient care journeys. At the ASRA Fall Meeting, you share what you have been working on at your institution, and, in return, your home institution has an opportunity to learn and grow from the advances presented.

In addition to attending the ASRA Fall Meeting annually, I am always asked by residents and fellows on how to

feel more engaged in the scientific community. Trainees should consider their unique role in the macro-system and their excellent (often under-utilized) potential to impact their local community, home program, and home institution. Trainees are blessed with intimate knowledge of local workflows, impasses, and challenges and often have innovative solutions to these focal problems. Success in advocacy and change management should begin in this local environment, including volunteerism with department-, hospital-, and enterprise-based committees. Concepts learned from this level of participation are necessary for further advocacy and leadership success

in larger arenas, including work with larger committees and task forces and on county- and state-based initiatives. ASRA is a wonderful outlet for further engagement beyond this level: ASRA

supports volunteer opportunities in process improvement, quality initiatives, and multidisciplinary pain education projects across the health spectrum (including patient- and nurse-focused education). Volunteer for small things and demonstrate follow-through, consistent and meaningful output, and trustable organizational skills. Your leadership skill set will be noticed, and your participation on larger projects and committees will be invited and welcomed! With this step-wise, experience-based approach, you can look forward to a rewarding leadership and advocacy career ahead.

Best of luck, and always remember to reach out to the mentors and connections you have made!

Stay in touch,

— Shalini Shah, MD

*"I have personally found that there is no better conference and society to "show up" to than that of ASRA. So, please, join us."*

# How I Do It: A Pathway for Total Knee Arthroplasty

Total knee arthroplasty (TKA) is a common surgery for advanced knee arthritis, and the procedure has been growing in frequency, particularly in communities with aging populations. As with many institutions, we have sought to create a regimen for postoperative analgesia that provides excellent pain control while simultaneously decreasing lower extremity weakness, diminishing the risk of postoperative falls, and meeting the goals of physical therapy. In this article, we will describe our current total joint pathway for TKAs.

TKA patients frequently present with significant comorbidities, such as diabetes (27%), hypertension (73%), pulmonary disease (21%), congestive heart failure (4%), and other chronic conditions. In addition, 61% of patients presenting for TKA at the University of Illinois Hospital are obese or morbidly obese. These comorbidities can frequently result in a prolonged recovery period following surgery. It is therefore imperative that any perioperative analgesic pathway is able to provide safe, effective, and prolonged anesthesia.

Two hours prior to presenting to the operating room, patients are asked to drink a 300 mL complex carbohydrate solution. This oral solution is withheld in the setting of delayed gastric emptying or symptomatic reflux disease. In the preoperative holding area, patients receive an oral pain pack which consists of acetaminophen 1000 mg, celecoxib 200 mg, and gabapentin 400 mg. Celecoxib is not given to patients with a history of renal insufficiency (creatinine > 1.5) or allergy (sulfa or celecoxib). Patients with any evidence of liver disease do not receive acetaminophen.

Regional anesthesia procedures are generally performed in the preoperative area. All patients have the option of receiving either combined spinal-epidural or general anesthesia as the primary

anesthetic. For the combined spinal-epidural, 2-3 mL of 0.5% isobaric bupivacaine is the typical dose for the spinal component. An epidural remains in place in case an extended duration of anesthesia is required to complete the surgical procedure. The epidural may be dosed with 2%

lidocaine or 0.25% bupivacaine as needed in doses of 3-5 mL to extend the duration of neuraxial anesthesia. Generally, a waning spinal anesthetic is manifested by obvious patient discomfort, tachycardia, or hypertension.

A regional analgesia technique is a consistent component of the multimodal postoperative pain management strategy. Our approach to postoperative regional analgesia has evolved over the past few years as an increased emphasis has been placed on efforts to expedite mobility and recovery. Regional analgesia techniques are usually performed prior to surgery. Prior to February 2018, femoral nerve catheters were part of the postoperative pain management regimen. Femoral nerve catheters were placed under ultrasound guidance and dosed with 10-20 mL of lidocaine 2% or bupivacaine 0.25%. The nerve block catheters were infused with a solution of 0.1% bupivacaine at a rate of 6 mL/hr with a 4 mL bolus every 30 minutes. Initially, the femoral nerve block catheters remained in place until day 2 (POD#2) to extend the duration of analgesia. However, to facilitate early physical therapy, the nerve catheter was frequently discontinued on POD#1 following multidisciplinary consultations with

orthopedics and physical therapy. Despite this transition, only a small fraction of patients achieved the ability to dangle and participate with physical therapy on POD#0.

In an attempt to facilitate earlier mobilization with physical therapy,

the pain management pathway for TKA has now migrated away from femoral nerve blocks/catheters and towards adductor canal blocks. The hope was to spare quadriceps motor function and optimize patient mobility on POD#0. Our current practice is to offer single-shot adductor



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*“We have sought to create a regimen for postoperative analgesia that provides excellent pain control while simultaneously decreasing lower extremity weakness, diminishing the risk of postoperative falls, and meeting the goals of physical therapy.”*

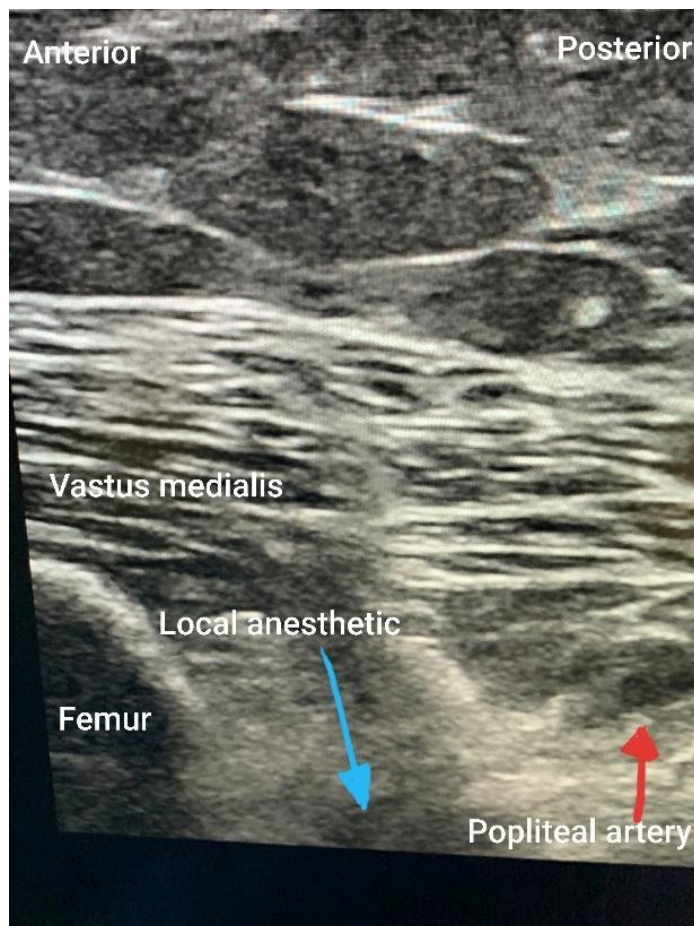
**Figure 1:** Adductor canal block with the needle lateral to the femoral artery underneath the sartorius muscle.



canal blocks and infiltration between popliteal artery and capsule of the knee (iPACK) blocks for postoperative pain control. Ultrasound-guided subsartorial saphenous nerve block/adductor canal blocks are performed by identifying the femoral artery beneath the sartorius muscle using a high-frequency linear transducer. Using either an in-plane or out-of-plane needle approach, local anesthetic is deposited lateral to the artery. The typical volume of injectate used for the subsartorial saphenous nerve block/adductor canal block is 20-30 mL of 0.25% bupivacaine, whereas 10-20 mL of the same local anesthetic is used for the iPACK block with a maximum volume of 40 mL.

Figures 1 and 2 demonstrate the sonoanatomy relevant to the performance of adductor canal and iPACK blocks. Figure 1 shows an in-plane subsartorial adductor canal block performed with the patient in the supine position and a linear ultrasound probe scanning at the mid-thigh.

**Figure 2:** iPACK block with local anesthetic deposited between the femur and the popliteal artery in an out-of-plane approach.



The femoral artery is visualized beneath the sartorius muscle. Local anesthetic is injected lateral to the artery in the expected location of the saphenous nerve and the nerve to the vastus medialis. Figure 2 shows an out-of-plane iPACK block, with the patient remaining in the supine position and a linear ultrasound scanning just above the knee with the leg externally rotated. On the left side of the screen, the femur is visualized, and on the right is the popliteal artery. Local anesthetic is deposited between these two structures.

Epidural catheters are dosed judiciously with local anesthetic near the end of surgery as not to limit patient ambulation on POD#0. Postoperatively, the epidural is removed prior to discharge from the recovery area. Patients are seen by the physical therapist on the day of their surgery, either in the recovery area or the orthopedics floor. Oral analgesics include acetaminophen

**Table 1:** *Retrospective audit of femoral nerve catheter vs adductor canal/iPACK single shot.*

Time Period	Dec 2015 - Jan 2017	Feb 2018 - Oct 2019
Postoperative pain block	Femoral nerve catheter	Adductor canal/iPACK single shot
Number of TKA cases	278	267
Mobility POD#0	0.92%	74.5%
Block limiting mobility POD#1	3.72%	0.83%
Ambulation (ft) POD#1	117	116

650 mg every 6 hours, celecoxib 200 mg every 12 hours, gabapentin 300 mg nightly, oxycodone CR 10 mg every 12 hours, as well as oxycodone IR and tramadol as needed. This multimodal pain regimen is continued until at least POD#2.

The ability to ambulate before and after the transition from femoral nerve block catheter to single shot adductor canal blocks were audited as part of a quality improvement project. The significant results of this transition are presented in Table 1.

Mobility refers to the percentage of patients who are able to participate in physical therapy the afternoon or evening following surgery, either by dangling or ambulating. The data above shows that ability to mobilize and participate in physical therapy on POD#0 increased by a large margin after our transition in regional technique. The ability to ambulate on POD#1 did not change significantly. Previously, femoral nerve catheters were removed early on the morning of POD#1, therefore, patients from both time periods likely had very little residual nerve blockade at the time of physical therapy evaluation, which would typically have been done later in the day.

The workflow of our regional service necessitates that most of our blocks for TKA patients be performed prior to surgery. Therefore, TKA patients do not receive continuous adductor canal or iPACK blocks, as these catheters would be in close proximity to the surgical field. There is therefore no ability to prolong the duration of the regional block beyond what is allowed by a single shot. However, patients appear to benefit from this regimen and have increased mobility on POD#1, as indicated by the data above.

Many institutions have shifted away from femoral nerve blocks and towards adductor canal blocks or saphenous nerve blocks, as we recently have. Previously published anatomical studies have identified the saphenous nerve and nerve to the vastus medialis as consistently located in the adductor canal.<sup>1</sup> Both of these nerves provide sensory innervation to the anteromedial joint capsule, and the nerve to the vastus medialis provides some motor function as well. Randomized controlled trials have demonstrated statistically significant increases in quadriceps strength for patients in severe pain after TKA.<sup>2</sup> A recent meta-analysis with 12 randomized controlled trials and 969 patients concluded that adductor canal blocks, whether single-shot or continuous, can achieve better analgesia compared to femoral nerve blocks while allowing for preserved quadriceps strength.<sup>3</sup> Further studies are needed to show whether adductor canal blocks can consistently result in a decreased time to ambulation, greater mobility, and shorter length of stay when compared to femoral nerve blocks. However, a good multimodal analgesic regimen is likely required as a complement to any regional anesthesia procedure.

Our evolving total joint pathway has allowed patients to mobilize and work with physical therapists more rapidly following TKA over the past few years. We will continue our efforts to promote faster recovery and greater patient comfort.

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# Cannabis as an Analgesic: Separating Hope from Hype

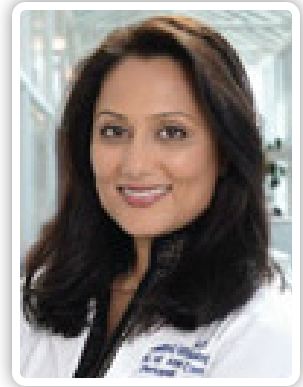
In the quest to alleviate suffering, the practice of pain management today is faced with major issues from different fronts, extending from the regulatory environment of opioids to the rising use of cannabis and cannabinoids for pain treatment. But with all the public attention on cannabis, what are we to believe? In the setting of the opioid epidemic, there has been a nationwide push to find analgesic alternatives that do not have the same addictive and lethal properties that opioid use elicits. Cannabis has been suggested as an efficacious, safer alternative or replacement for opioid analgesics.<sup>1,2</sup> However, the gap between these benefits and the scientific evidence for high-quality research (randomized control trials, multicenter clinical trials) remains wide, largely due to the national restrictions that have been placed on cannabis research. These limitations are largely related to its status as a schedule 1 substance with the Drug Enforcement Agency.<sup>3</sup> This gap in knowledge is highlighted by the fact that this is one of the only times in U.S. history where a medication was determined efficacious for medical conditions, not by scientists nor researchers, but by the general public.<sup>4</sup>

When discussing the therapeutic components of cannabis, the major active substances thought to provide the most biologic effect are the phytocannabinoids delta-9 tetrahydrocannabinol (THC) and cannabidiol (CBD). One theory suggests that these two components are the cannabinoids that are primarily responsible for cannabis's analgesic properties. However, we must acknowledge that our understanding of the physiologic effect of these cannabinoids as well as the function of the endocannabinoid system as a whole is still primitive and requires more robust research in the basic science and clinical realm. Furthermore, there are more than 100 minor cannabinoids, terpenes, and flavonoids within the cannabis plant that have some evidence to support analgesic benefits.<sup>5,6</sup> Therefore, an alternative theory suggests that a more complicated interaction between all the numerous components of the cannabis plant play a role in analgesia via an "entourage effect."<sup>7</sup> In short, the exact mechanisms by which cannabis produces analgesic effects are still not clearly understood.

*"This is one of the only times in U.S. history where a medication was determined efficacious for medical conditions, not by scientists nor researchers, but by the general public."*



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Cannabis has historically been used as a pain reliever dating back to ancient times.<sup>8</sup> The presence of the endocannabinoid system in vertebrate species evolved approximately 600 million years ago, whereas the first signs of the plant species of cannabis originated only 25 million years ago.<sup>9</sup> The main receptors that cannabis and cannabinoids physiologically impact are cannabinoid 1 receptors (CB1) and cannabinoid 2 receptors (CB2). CB1 receptors are located mainly in the brain and central nervous system while CB2 receptors are localized primarily in the periphery and associated with cells of immune function.<sup>10,11</sup> Because of the location of CB1 receptors in the brain, spinal dorsal horn, dorsal root ganglia, and peripheral afferent neurons, the analgesic effect of cannabis and cannabinoids is believed to be due to agonism of CB1 receptors.<sup>12</sup> There is also a potential anti-inflammatory effect that is largely attributed to its effect on CB2 receptors which are located mainly in cells of immune function.<sup>12</sup> Additional receptor targets

of cannabinoids (ie, TRPV1) require further study to elicit their role in pain.<sup>12</sup>

The current literature on cannabis and cannabinoids is limited and often conflicting. One review focusing on cannabis use for pain may assert benefits while another supports negative or no effects.<sup>12,13</sup> What is consistent in the reviews of chronic pain treatment is that cannabis does demonstrate analgesic benefit, mostly on neuropathic pain conditions, comparable with current neuropathic pain agents.<sup>14</sup> However, many of the clinical trials in these review articles contained small sample sizes and had short duration treatment periods. Furthermore, there is little uniformity between studies in terms of cannabinoids used, dosages, concentrations, and modes of administration.<sup>14</sup> While efficacy is one concern, another large consideration is safety of cannabis as a therapeutic agent. The COMPASS trial demonstrated that quality-controlled herbal cannabis use, as part of a monitored treatment program over one year, appears to have a reasonable safety profile with no increase in serious adverse events. Significant, non-serious adverse events were reported, the most common of which were headache, nasopharyngitis, nausea, somnolence, and dizziness.<sup>15</sup> Unlike opioids, there are no cannabinoid receptors located in the ponto-medullary area which may explain the lack of evidence for cannabis causing the serious and lethal respiratory depression effect that is seen with opioids.<sup>16,17</sup>

As of today, 33 states and the District of Columbia have legalized cannabis in some form for medicinal use in certain health conditions.<sup>18,19</sup> Of these, 11 states and the District of Columbia have approved laws for the recreational use of cannabis, with Illinois becoming the most recent state to legalize recreational use of the plant.<sup>18</sup> In accordance with these state law changes, there has been an unprecedented expansion of the types of cannabis and cannabinoid products (many of which have not been studied or researched) available to the public, even though cannabis remains illegal at the federal level.<sup>20</sup> Largely because of these changes in law and public sentiment towards cannabis, we have seen greater acceptance of its use as both a medicinal and recreational drug.

There is an abundance of optimism and promise that cannabis and its multiple components have the potential to be tailored to specific pain conditions and provide analgesia without opioid use. However, as physicians, we must be cautious in our recommendation of this drug until we have a strong scientific foundation to stand on.

Although cannabis might be considered relatively safe when compared to opioids,<sup>15,21</sup> there have been significant adverse events related to cannabis administration that have been well documented in the literature. These adverse outcomes have included possible precipitation of a myocardial infarction,<sup>22</sup> short-term memory loss,<sup>23</sup> worsening of psychological disease,<sup>24</sup> and development of respiratory condition (chronic bronchitis).<sup>25</sup> Additional studies evaluating cannabis use in pain management are required to determine the true safety and efficacy profile of this medication, ideal mode of administration, and drug-drug interactions as well as its effects in specific patient populations such as the pregnancy, geriatric, and pediatric populations. In addition, longer-term monitoring for functional outcomes are needed, and future studies will need to address issues around standardization of dose, various types of cannabinoids and effective concentrations, and modes of administration as well as its role in specific pain phenotypes.

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# Virtual Reality for Pain Management: A Guide to Clinical Implementation

## INTRODUCTION

Despite efforts to enhance hospital environments, patient experiences inherently remain stressful and unpleasant. Amidst foreign surroundings, combined with apprehension regarding potential investigations and treatments, a fundamental premise of patient satisfaction and improved clinical outcomes may hinge on the ability to *get away* altogether. By transitioning patients into *another* virtual world, virtual reality therapy (VRT) provides an opportunity for disruptive innovation<sup>1</sup> in the medical community. Namely, the disrupted is the current multimodal pharmacologic and interventional therapies available for acute and chronic pain management, and VRT is the disruptor. VRT arrives at an auspicious time to help leverage the opioid epidemic that claims more lives than traffic-related injuries nationally.<sup>2</sup> Pain medicine specialists and anesthesiologists must be nimble and amenable to modalities that intend to enhance the repertoire of opioid-sparing strategies available.<sup>2</sup> It should be noted that most devices are currently marketed as wellness devices, without formal Food and Drug Administration (FDA) approval, and with clinical investigations ongoing. This article will discuss clinical application of VRT while outlining the steps pursued for implementation at University of California Irvine (UCI) Health.

## THE SCIENCE OF VIRTUAL REALITY

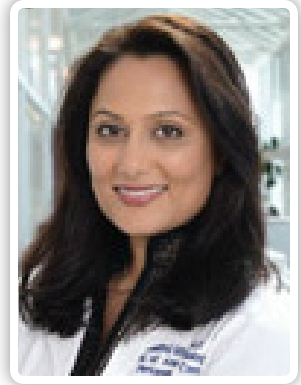
Maani et al<sup>3</sup> illustrated that VRT can be used as an effective adjunctive analgesic for severe burn wound cleaning procedures. When combat soldiers were solely given an intravenous ketamine bolus, they rated the cleansing as “no fun at all”; interestingly, when combining the ketamine bolus with concomitant VRT, the same patients newly rated wound care as “pretty fun” or “extremely fun”.<sup>3</sup> Indeed, VRT relies on computer technology and multisensory input to synthetically create a surrogate 3D atmosphere that a



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*“Offering an opportunity for environmental change, virtual reality therapy exemplifies a mechanism for hospitalized patients to safely practice mindfulness.”*

user can *escape* to.<sup>2</sup> While augmented reality relies on incorporating additional digital components to a real live view, VRT is an absolute immersion experience that is achieved by using hardware (typically a headset) with access to appropriate software (perhaps a peaceful spot in nature or an interactive gaming sequence).<sup>4</sup> Along the lines of precision medicine,<sup>5</sup> content selection and application can be tailored to meet each clinical scenario and patient preference. Technology has made VRT affordable and compact, with mobile point-of-care utilization. Proposed applications of VRT in the realm of pain management

are diverse and include acute and chronic clinical conditions (Figure 1).<sup>2-4,6-8</sup> The use of VRT in pediatric care appears to be promising, for example, in precluding pain with venipuncture.<sup>9</sup> Consistent with the patient-centric visions of enhanced recovery after surgery<sup>10</sup> and the perioperative surgical home,<sup>11</sup> VRT has also been described in the realm of perioperative medicine,<sup>12</sup> such as reduction of preoperative anxiety<sup>13</sup> or postoperative pain<sup>4</sup> after a medical procedure. While consensus on the

**Figure 1:** *Proposed applications of virtual reality in the realm of pain management.*

Virtual Reality Applications
Distraction from painful stimulus or anxiety with procedures: IV starts, regional blocks, wound care
Chronic pain conditions: sickle cell, lumbago, phantom pain, fibromyalgia, complex regional pain
Labor and delivery: distraction, breathing support
Perioperative pain and anxiety reduction throughout the surgical continuum: before, during, and after
Mental health conditions: anxiety, depression, phobia, PTSD treatment
Oncology: application during infusion or chemotherapy treatment
Ambulatory clinic setting: nonclinical use when awaiting clinical encounters, biofeedback programs

**Figure 2:** *Relative contraindications to virtual reality utilization.*

Virtual Reality Contradictions
Motion sickness or active nausea/vomit
Neurologic issues: recent stroke, uncontrolled seizure, severe dementia, vestibulo-ocular problems
Isolation status for infection control
Claustrophobia

clinical utility of VRT has yet to be achieved,<sup>4</sup> preliminary results appear favorable in the context of reducing pain and anxiety. Research findings have consistently demonstrated favorable reductions in acute pain, but further investigation is required to determine if there are longitudinal effects in chronic pain.<sup>2-4,6-8</sup> Although there are considerations that may prevent universal use (Figure 2), the technology is largely safe,<sup>2-4,6-8</sup> with patient refusal being the only *absolute* contraindication.

Diverse hypotheses have been proposed to elucidate how VRT may regulate the experience of pain. These theories include elements derived from the Gate Control Theory,

the Multiple Resources Theory (which proposes that sensory systems function autonomously and sensory distraction is key), and, more recently, postulation that specific pain modulation pathways are altered as evidenced by functional MRI studies.<sup>7</sup> What appears uniform in the proposed theories is an inclination to explain VRT via the concept of mindfulness, which is defined as “moment-by-moment awareness...a state of *psychological freedom* that occurs when attention remains quiet and limber, *without attachment* to any particular point of view.”<sup>14</sup> Offering an opportunity for environmental change, VRT exemplifies a mechanism for hospitalized patients to safely practice mindfulness.

## CLINICAL IMPLEMENTATION OF VIRTUAL REALITY AT UC IRVINE HEALTH

With the general popularity of VRT and applications in healthcare growing, there was interest at UCI Health to further investigate implementation at our institution. Leadership selected a physician champion to help navigate the evaluation and assessment process. A strategic team including physician and nursing leadership, information and technology experts, and research support was constructed. The team then elected to conduct a needs assessment survey to tailor and vet optimal implementation strategies. A Likert scale, 26-question Qualtrics® survey was distributed to all UCI Health attending physicians.<sup>15</sup> A total of 105 voluntary responses were received with 8 excluded due to incompleteness, leaving a total of 97 responses for interpretation. Respondents came from a variety of specialties including both medical and surgical subspecialties, with anesthesiologists being the most represented at 27%. Greater than 66% of respondents welcomed VRT as a new modality for pain management. Physicians highlighted cost, user training, and equipment availability as factors most likely to impede clinical growth. Three divisions emerged as the most motivated to pursue clinical application: 1) Pain Medicine, 2) Burn Surgery/Critical Care, 3) Hematology/Oncology (Infusion Therapy).

The next step in the process was determining a specific hardware and software pairing that met UCI’s clinical needs. The initial investigation focused on an “over-the-counter” device, similar to one available for purchase and use by the general population. From a cost perspective, this was the most pragmatic approach, with typical units starting at around \$399 and devoid of any subsequent licensure subscription fees. While ideal in certain proposed applications, several shortcomings manifested during our research that directed us towards



other approaches. Most notably, simply buying a VRT headset targeted for broad use in the general population failed to provide software (content) specifically curated and studied for use in the medical field. Additional shortcomings included an absence of infection control protocols, an absolute need to utilize Wi-Fi for streaming, a scarcity of customer support, and a lack of gaze-based control. Gaze-based control was a desirable feature because it ensured proper use of the device in a tilted position, such as when a patient was placed in the Trendelenburg position for a procedure and would otherwise not have been able to navigate an avatar beyond a narrow scope of view.

Using a vendor specific to the realm of medicine and specifically pain management was deemed most likely to meet UCI's clinical needs. A healthcare-specific vendor allowed for access to hardware and licensed content aimed for medical use, proprietary infection control and cleaning protocols, and ongoing training and technical support.<sup>16</sup> However, as VRT remains to be reimbursed by insurers, cost had to be considered alongside the potential to yield additional value<sup>17</sup> in clinical outcomes. With these vendors, each unit costs around \$500-\$1,000 and annual subscription fees can hover near \$3,500 per unit, with negotiation considerations for bulk orders.<sup>16</sup> Delshad et al<sup>16</sup> analyzed the "return on investment" for inpatient VRT to provide a guide for cost and effectiveness thresholds. Analyzing key hospital metrics including opioid use, hospital length of stay, and reimbursement from enhanced patient satisfaction scores, the authors were able to demonstrate a net cost-savings of \$5.39 per patient primarily via a reduction in length of stay with VRT.<sup>16</sup> We propose that access to VRT also may be a prudent marketing strategy, as prospective patients may view participating hospitals as more "cutting-edge." Moreover, an inpatient pain service that is a key stakeholder and well versed in clinical application of VRT may receive supplementary consultations, further contributing to profit margins. With these insights, it can be argued that supporting access to VRT for patients who are most likely to benefit is a principled fiscal approach.

At UCI Health, units and subscriptions were purchased to support our three identified divisions that expressed the most interest to pilot clinical application as well as a means for funding. We deemed that this would permit an opportunity to research and ascertain if the units are appropriately being used while demonstrating a value-add<sup>17</sup> to patient care. Supporting technology advancement is important since it is dynamically evolving, with newer devices continually being marketed.

Ultimately, we believe the value proposition of VRT is that it exemplifies the Institute for Healthcare's triple aims: improving the experience of care, improving the health of populations, and reducing per capita costs of health care.<sup>18</sup>

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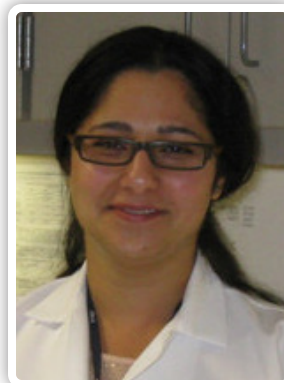
# How I Do It: Stellate Ganglion Blocks

The stellate ganglion block is a diagnostic and therapeutic modality commonly used for patients with complex regional pain syndrome of the upper extremity, phantom limb pain, neuropathic pain, atypical facial pain, arterial vascular insufficiency of the upper extremity, hot flashes, and psychiatric disorders such as post-traumatic stress disorder, as well as to temporarily interrupt sympathetic stimulation in the heart for electrical storm and angina.<sup>1-3</sup>

Sympathetic fibers from the head, neck, upper extremities, and heart arise from the first thoracic segment and ascend in the sympathetic chain to synapse in the superior, middle, and inferior cervical ganglion. The stellate ganglion is a sympathetic ganglion formed by the fusion of the inferior cervical and first thoracic ganglion. It is located anterior to the transverse process, medial to the scalene muscles, and lateral to the trachea, thyroid, esophagus, carotid artery, and internal jugular vein. An abnormal connection between the sympathetic and sensory nervous system can lead to sympathetic mediated pain.

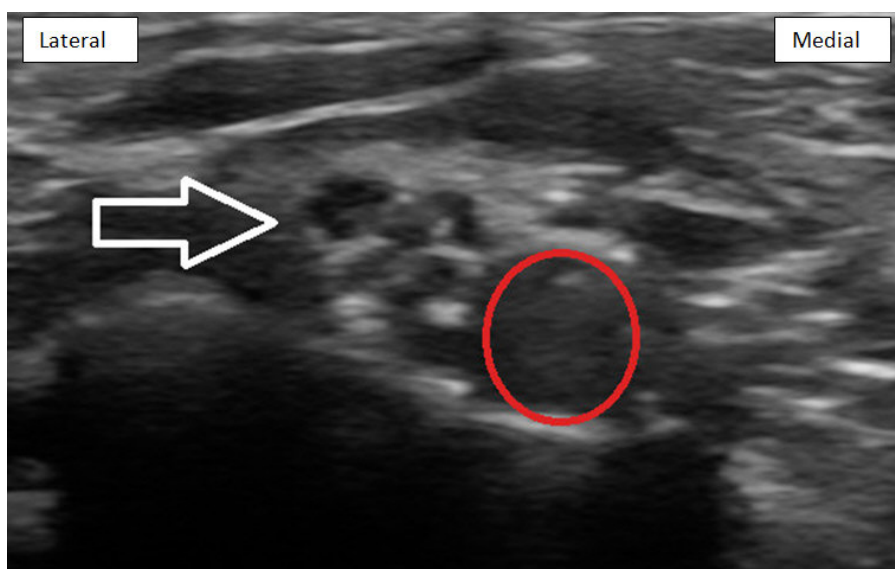
The therapeutic effects from a sympathetic block may result for the interruption of this neuronal connection.<sup>4</sup> Many techniques have been described to block the stellate ganglion which may account for the variability in response and efficacy. Historically, stellate ganglion blocks were performed blindly by palpating the prominent anterior tubercle of the transverse process of C6 (Chassaignac's tubercle),<sup>5</sup> but this technique was associated with

significant risk of injury to the surrounding vascular and soft tissue structures. Fluoroscopic-guided stellate ganglion blocks improve delineation of bony anatomy but not soft tissue. Image-guided stellate ganglion blocks by computed tomography (CT)<sup>6</sup> and magnetic resonance imaging<sup>7</sup> offer better visualization but are neither cost nor time efficient. Furthermore, CT exposes the patient and the provider to increased radiation. A method that has gained popularity is ultrasound-guided blockade of the stellate ganglion, which offers precise anatomical targeting while minimizing unintentional puncture of vital structures and reducing local anesthetic volume. This method was initially described by placing the needle in the region of the transverse process of C6.<sup>8</sup> It was later refined with needle placement at C6 beneath the prevertebral fascia over the longus colli muscle.<sup>9</sup> We describe an approach that will allow practitioners to re-confirm the ultrasound sonoanatomy of the stellate ganglion by properly identifying the C6 from C7 transverse process by performing a nerve root scan.



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**Figure 1:** *Supraclavicular plexus (white arrow) and subclavian artery (red circle).*

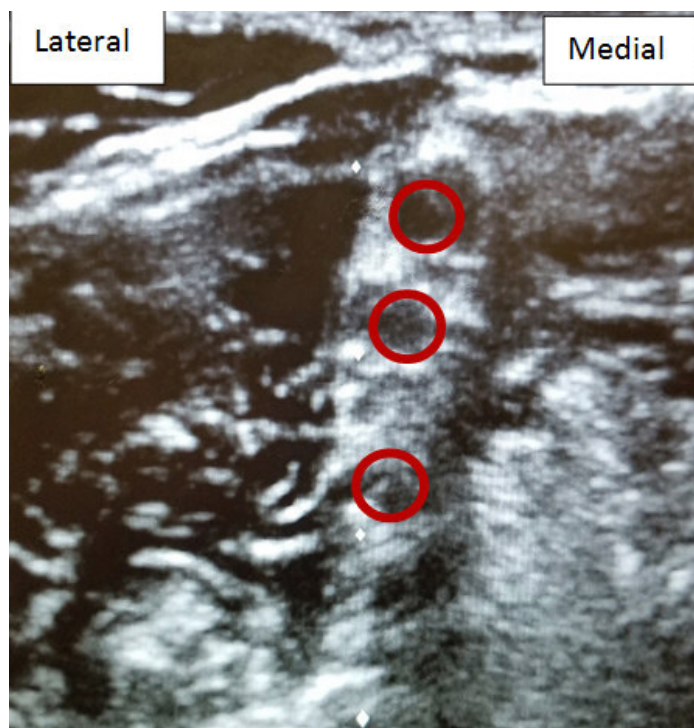


## RE-CONFIRMATION WITH NERVE ROOT SCANNING

Vertebral ultrasonography can give rise to chaotic imaging from acoustic shadowing as the ultrasound wave strikes bone and becomes reflected. We describe an approach that will allow practitioners to differentiate the C6 from the C7 transverse process by tracing the nerve cephalad while identifying the differences between the tubercles of C6 and C7. Ultrasonography provides an exceptional capability to depict nerve roots and allows for proper identification at the appropriate level.<sup>10</sup>

**Scanning Technique.** The patient is placed in a supine position with the head turned to the opposite side. The high-frequency linear transducer is placed in a short-axis view proximal to the clavicle. The subclavian artery is identified, and the

**Figure 2:** Interscalene plexus (red circles represent C5, C6, and C7 nerve root).



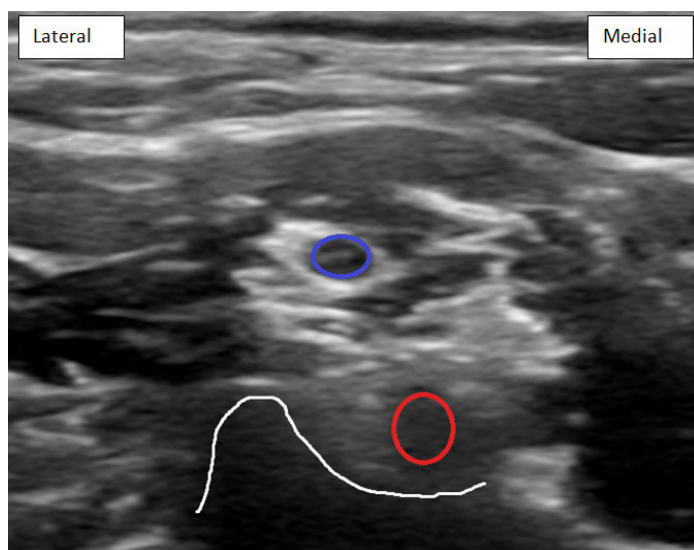
supraclavicular plexus is seen as a hypoechoic bundle superior and posterior to the artery (Figure 1).

*“Ultrasound-guided blockade of the stellate ganglion offers precise anatomical targeting while minimizing unintentional puncture of vital structures and reducing local anesthetic volume.”*

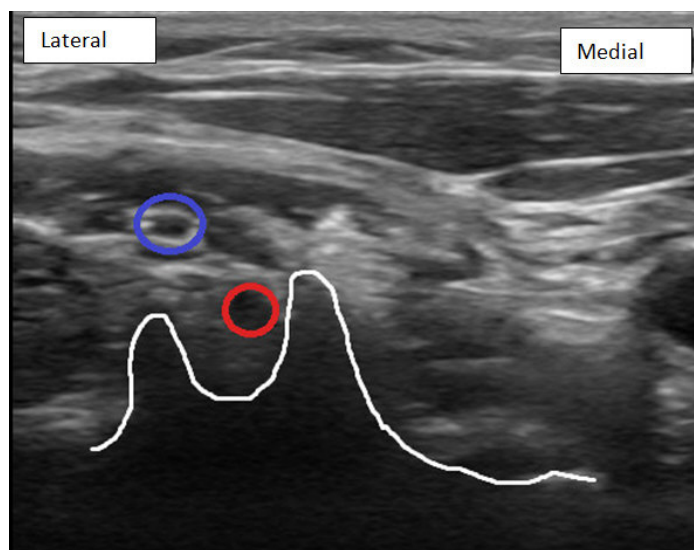
The transducer is moved in a cephalad and medial fashion to identify the interscalene plexus between the anterior and middle scalene muscles (Figure 2).

Subsequently the nerve roots can be followed as they return to their corresponding intervertebral foramen by moving the transducer slightly medial. In the traditional “stoplight sign” orientation of the nerve roots, C5, C6, and

**Figure 3:** C7 nerve root (red circle) entering foramen in front of posterior tubercle (outlined in white). C6 nerve root (blue circle) is visualized above the C7 nerve root.

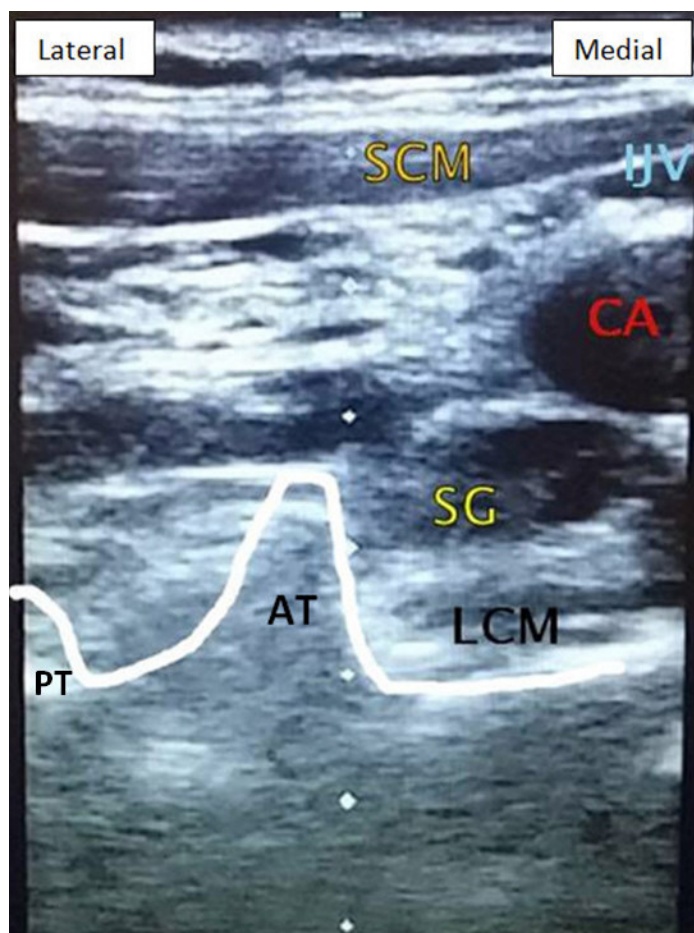


**Figure 4:** C6 nerve root (red circle) entering foramen at C6 transverse process with prominent anterior tubercle and short posterior tubercle (outlined in white). C5 nerve root (blue circle) is visualized above C6 nerve root.





**Figure 5:** *Stellate ganglion block at C6 level.*



AT, anterior tubercle; PT, posterior tubercle; SCM, sternocleidomastoid muscle; IJV, internal jugular vein; LCM, longus colli muscle; SG, stellate ganglion with local anesthetic infiltration.

C7 can be identified by their relative vertical position. The C7 nerve root can then be easily traced and visualized as it enters the foramen in front of the posterior tubercle (Figure 3).

The transducer is moved cephalad and slightly lateral to visualize C6 nerve root entry from the interscalene plexus to the foramen between the prominent anterior tubercle and shorter posterior tubercle (Figure 4).

Once the transverse process of C6 is identified and confirmed, a 22 gauge 1.5" (40 mm) spinal needle is advanced using an in-plane technique from lateral to medial. Local anesthetic is deposited beneath the

prevertebral fascia and above the longus colli muscle (Figure 5).

## CONCLUSION

A technical challenge that practitioners may encounter when performing an ultrasound-guided stellate ganglion block is the proper identification of the C6 and C7 transverse process. We recommend supplementing this technique by scanning from the supraclavicular plexus to the interscalene plexus and following the nerve roots into the corresponding foramen. This approach will re-confirm that the C6 and C7 transverse process are properly identified.

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# Sympathetic Blocks for Postoperative Pain Control After Surgery: Literature Review and Current Evidence

## CURRENT ZEAL FOR SYMPATHETIC BLOCKS

Sympathetic blocks have recently gained attention for the potential to supplement postoperative analgesia. The stellate ganglion block (SGB) is a well-studied block for the provision of analgesia following upper limb orthopedic surgeries.<sup>1,2,3</sup> SGB may prove beneficial at a time when motor and sensory assessment is requested by a surgeon in the immediate postoperative period.<sup>1</sup> It has been suggested that sympathetic blocks may also be beneficial as a strategy to limit the development of complex regional pain syndrome (CRPS) in the postoperative period.<sup>4,5</sup>

Sympathetic blocks may also facilitate the prompt diagnosis of compartment syndrome (CS) via the provision of analgesia without significant motor or sensory blockade. Although dilute concentrations of local anesthetic (LA) used for peripheral nerve blockade and postoperative pain management may not hinder the diagnosis of CS, higher concentrations of LA may mask CS and delay diagnosis secondary to similarities in the clinical presentation of somatic nerve blockade and CS.<sup>6</sup> Although the benefits of sympathetic nerve blocks on the ability to detect CS are conceptually appealing, significantly more robust evidence is needed to confirm this hypothesis.

## GUIDING PRINCIPLES

Pain caused by sympathetic stimulation tends to be considered more frequently in chronic pain. The rationale behind the use of SGB for postoperative pain management dates back to the 19<sup>th</sup> century. A correlation between the sympathetic nervous system (SNS) and acute pain was made in 1860 when Dr. Silas Weir Mitchell noticed sympathetic involvement following penetrating limb injuries in Civil War victims and defined those as causalgias.<sup>7</sup> In an editorial in 1992, Forrest described the involvement of the SNS throughout the nociceptive stages after tissue injury.<sup>8</sup> His description included four stages of events following initial cellular trauma until tissue healing. Stage 1 is the activation of chemical mediators of nociception; stage 2 describes primary hyperalgesia due to sensitization of peripheral nerve endings; stage 3 is marked by hyperalgesia in spinal nerves, efferent reflexes, and secondary hyperalgesia;

and stage 4 is characterized by the resolution of sensitization. Intervention during these stages reduces postoperative pain. The SNS is implicated in mediation of both stage 1 (by augmenting release of chemical mediators) and stage 2 (by potentiating the effect of substance P and primary hyperalgesias). In 2000, Baron disclosed the existence of a “cross talk” mechanism between the SNS of pathologic nerves and sensitized afferent nociceptors and described how this relationship culminated in an enhancement of pain.<sup>9</sup>

## INITIAL REALIZATIONS

These findings attracted further evaluation of sympathetic blockade for acute pain control. In



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*"The clinical features of CRPS are indistinguishable from those of acute pain in the early postoperative period, adding justification to the use of SGB to address postoperative sympathetic stimulation."*

human volunteers, under physiological conditions, an SGB placed prior to evoked acute pain appeared to be ineffective in reducing the acute pain due to absence of prior sensitization of nociceptive pathways by the pain.<sup>10</sup> In spite of the outcome, inhibiting transmission in the sympathetic nervous system seems to be beneficial as a

mechanism to prevent progression from acute pain to CRPS.<sup>7</sup> This concept gained strength when sympathetic blocks prevented CRPS recurrence in the postoperative period in patients with a previous history of CRPS.<sup>4</sup> It has also been noticed that the clinical features of CRPS are indistinguishable from those of acute pain in the early postoperative period, and this adds justification to the use of SGB to address postoperative sympathetic stimulation.<sup>5</sup> It is interesting to note that SGB also has been effective in relieving severe, refractory postoperative pain following upper limb surgery in patients without a history of CRPS.<sup>11</sup> Therefore, inhibition of sympathetic activation prior to or during surgery may contribute to better analgesic control.<sup>11</sup>

## CURRENT PERCEPTION

A randomized, controlled trial investigating the effectiveness of preoperative SGB on postoperative pain demonstrated a nonsignificant reduction in postoperative opioid consumption in the SGB group versus saline in 30 patients following upper limb orthopedic surgeries. A limitation of this study is that it included only relatively healthy subjects which may limit its generalizability.<sup>2</sup> Dexmedetomidine also has been added as an adjuvant to LA for SGB and noted prolongation of SGB effect.<sup>3</sup> However, the clinical benefit remains uncertain.

## CONCLUSION

In conclusion, the benefits of SGB for postoperative pain management need to be further investigated with robust clinical trials. There may be a role for sympatholysis in the prevention of CRPS following trauma and in the early detection of CS. However, current evidence has not been sufficient to support its widespread clinical implementation.

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# Surgical Considerations for Spinal Cord Stimulation Implant

## INTRODUCTION

Spinal cord stimulation (SCS) is now an established therapy indicated for the treatment of chronic pain of the trunk and limbs. Specific indications may include failed back surgery syndrome, neuropathic pain (due to various etiologies including radiculopathy and peripheral neuropathy), and chronic regional pain syndrome. Critical to the success of this therapy are appropriate patient selection, diagnosis, and meticulous perioperative planning. Herein, we outline infection mitigation strategies for the implanting physician planning percutaneous spinal cord stimulator lead and battery placement.

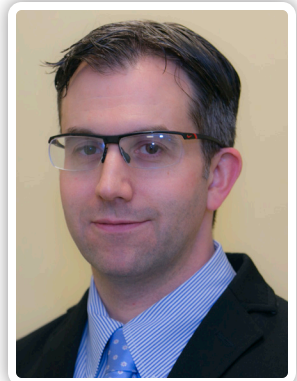
## MITIGATION OF INFECTION RISK

Adherence to strict sterile operative technique during SCS trialing and implantation is mandatory. The Neurostimulation Appropriateness Consensus Committee (NACC) released guidelines that address 35 consensus points representing best practices for infection mitigation.<sup>1</sup> The 35 consensus points themselves, as well as the strength of recommendation, were derived from evaluation of studies from the United States Preventive Task Force hierarchies.<sup>2</sup> Understanding and implementing these best practices is vital to ensuring safe and successful SCS implantation.

Recently, Falowski et al<sup>3</sup> extracted data from the Marketscan® Commercial Claims and Encounters Database (2009–2014) and the Medicare Supplement databases (2011–2014) with the goal of estimating the risk of surgical site infection (SSI) following SCS insertion. At 12 months following SCS implantation, the risk of surgical site infection was found to be 3.11%,<sup>3</sup> with most infections occurring within the first 90 days. Significant factors that were found to increase the risk for development of SSIs included the presence of peripheral vascular disease, history of previous infection in the 12 months prior to surgery, and younger age. Hoelzer et al conducted a retrospective review across 11 study sites (including seven academic centers) and reported a lower SSI rate of 2.45%.<sup>4</sup> In this review, statistically significant risk factors for infection included surgeries performed at



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academic centers and initial trial length exceeding five days. Significant protective factors included the application of an occlusive dressing and prescription of postoperative antibiotics (beyond 24 hours following surgery).

Interestingly, neither study identified tobacco use, poorly controlled diabetes mellitus, or obesity as independent risk factors for infection. Acknowledging the limitations of a retrospective study design, the remainder of this article will attempt to describe several perioperative infection

control practices that may significantly impact the development of SSIs.

In an international survey that aimed to evaluate perioperative infection control practices encompassing SCS implantation, approximately 50% of the 506 physician respondents reported extending antibiotic therapy beyond the 24-hour postoperative

period for both trials and implants.<sup>5</sup> Multiple studies have demonstrated that there is no benefit to continuing postoperative antibiotic therapy beyond 24–48 hours following spine surgery,<sup>6</sup> orthopedic cases,<sup>7,8</sup> maxillofacial surgery,<sup>9</sup> and cardiac surgery.<sup>10</sup> Indeed,

prolongation of antibiotic therapy has been associated with an increased duration of hospital stay, longer time until normalization of body temperature, and higher serum markers of inflammation (ie, C-reactive protein) following instrumented spine surgery.<sup>11</sup> The World Health Organization examined the optimal duration of antibiotic prophylaxis by pooling the results of 69 randomized controlled trials that included 21,243 patients.<sup>12</sup> They found moderate evidence that there is no benefit to postoperative continuation of antibiotic prophylaxis beyond 24 hours, with only low-quality evidence for benefit derived from prolonged administration in select cardiac, vascular, and orthognathic surgeries. Additionally, patients who received prolonged continuation of antibiotics reported an increased frequency of clostridial enterocolitis, rash, erythema, phlebitis, hypotension, pruritus, and GI symptoms. Cost savings associated with shorter antibiotic regimens ranged from \$1,644 to \$3,690.<sup>12</sup>

Reducing SSI through mitigation of known risk factors including poorly controlled diabetes mellitus, obesity, and smoking status are critical for reducing infection risk. Diabetic patients have a 50% increased risk of SSI across surgeries in general (doubled in cardiac surgery).<sup>13</sup> Patients with HbA1c levels of 7.5 mg/dL demonstrated significantly higher rates of deep SSI following single-level decompression (Odds Ratio 2.9).<sup>14</sup> Obesity, typically defined in the literature relating to SSI as a body mass index higher than 35, is commonly identified as an independent risk factor for SSI.<sup>15-17</sup> In lumbar spine procedures, adipose thickness at the site of surgical incision may be a more significant factor when estimating SSI risk than obesity in and of itself.<sup>18</sup> History of smoking increases the risk for SSI following elective surgical procedures by 50%, and this risk is doubled if patients smoke on the day of surgery.<sup>19</sup> In a recent meta-analysis of 67,405 patients undergoing spine surgery, smokers had a 26% increased risk of SSI compared to non-smokers.<sup>20</sup>

NACC recommends the following for infection management practice (evidence level I; recommendation strength A) for both trials and implants unless otherwise indicated.

- Decolonize methicillin sensitive *Staphylococcus aureus* (MSSA)/ methicillin resistant *Staphylococcus aureus* (MRSA) **carriers** through application of mupirocin ointment and chlorhexidine baths.
- Use preoperative antibiotics for trials and implants using weight-based dosing and appropriate timing (within 1 hour prior to surgical incision, with the exception of vancomycin).
- When required, remove hair immediately prior to

surgery with electrical clippers.

- If incise drapes are used, use iodophor-impregnated drapes.
- Use laminar flow and high-efficiency particulate air (HEPA) filters in the OR for implants.
- Limit procedure room traffic.
- Do not continue postoperative antibiotics beyond 24 hours.

NACC recommends the following for infection management practice (evidence level II; recommendation strength B) for both trials and implants unless otherwise indicated.

- Identify and treat all remote infections prior to trials and implants.
- Optimize glucose control.
- Discontinue tobacco use.
- Perform preoperative surgical scrub for a minimum of 2-5 minutes prior to surgery.
- Keep nails short, and do not wear artificial nails.
- Wear a surgical mask and cap or hood to fully cover hair.
- Use sterile gown and gloves; double glove.
- Limit operative time.
- Apply an occlusive dressing for 24-48 hours.

NACC recommends the following for infection management practice (evidence level III) for both trials and implants unless otherwise indicated.

- Do not wear arm or hand jewelry.
- Limit tissue trauma, maintain hemostasis, eradicate dead space, and avoid electrocautery at tissue surface.
- Understand maximum time criterion of 1 year for defining a deep SSI of an implantable device.
- Educate family and patient on proper incision care, symptoms of SSI, and importance of reporting symptoms.
- Wash hands before and after dressing changes, and use sterile technique.
- When SSI is suspected, prescribe an appropriate antibiotic that covers the likely causative organisms (consider local resistance patterns and culture results).

## WOUND CLOSURE

In preparation for closure, adequate hemostasis and copious irrigation should occur. Appropriate wound closure should achieve the following goals: closure of dead space, support for wound during healing process, maximization of blood flow, approximation of wound edges, minimization of bleeding, mitigation of infection

risk and decreased bacterial contamination, and durable cosmesis.<sup>21</sup> Wound edges should be everted and well approximated, and closure should provide adequate prolonged support during wound healing.

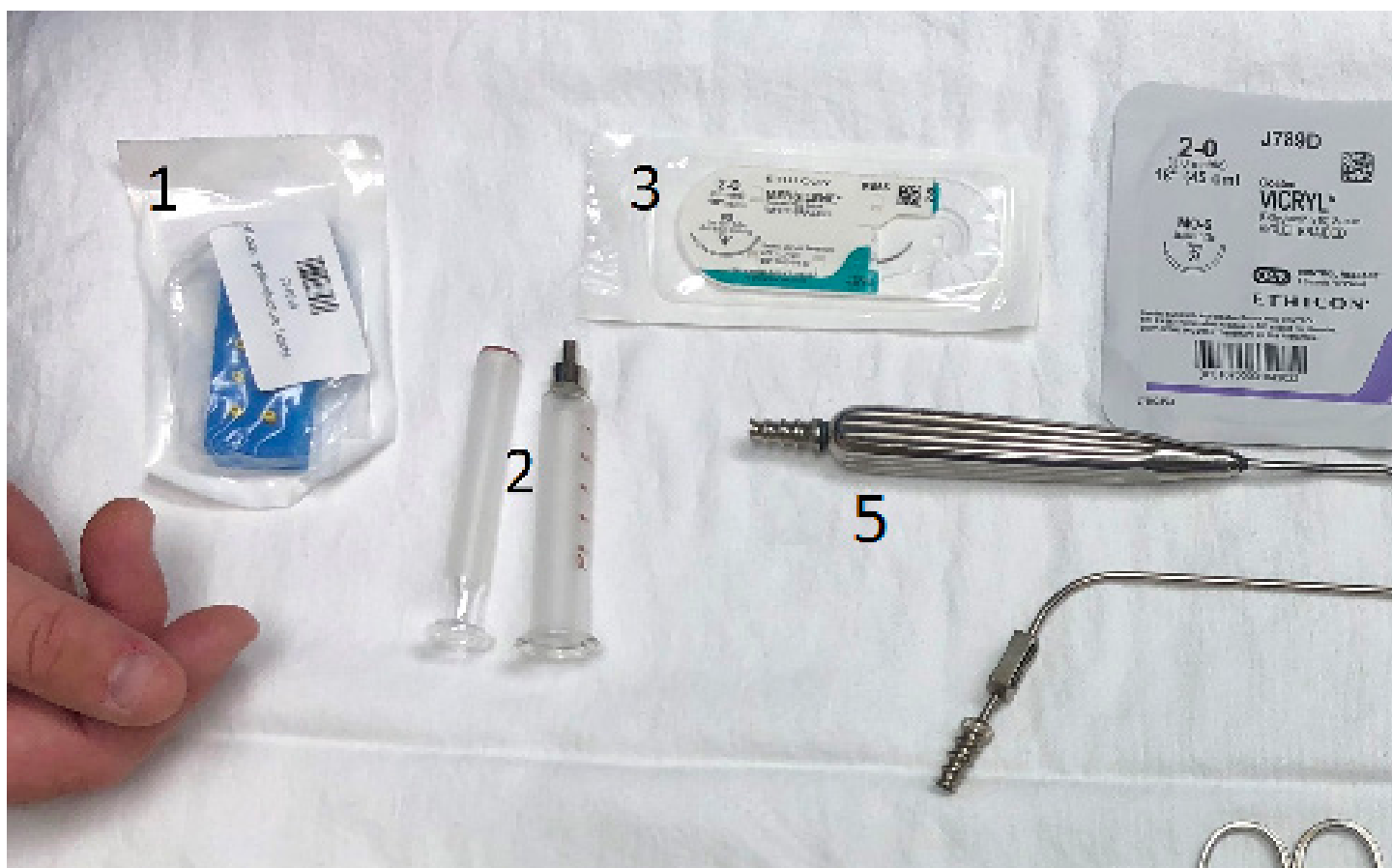
## TYPE OF SUTURE

Synthetic, nonabsorbable suture is used for anchoring and may include polyester (Ethibond™), polypropylene (Prolene®), or nylon (Ethilon®). Nonabsorbable sutures retain most of their tensile strength after 60 days. Although silk is classified as a nonabsorbable suture, it does degrade in tissue with a variable rate and therefore loses its tensile strength. Nylon sutures offer high tissue strength with low tissue reactivity and are inexpensive but may be more cumbersome, particularly when working in deeper fascia. Polypropylene sutures exhibit high tensile strength, low tissue reactivity, and good infection resistance but offer low elasticity.

Polyester suture is braided and has significant strength and durability. A minimum of five throws are required to maintain knot security.

Absorbable sutures are used to decrease dead space and encourage subcutaneous wound approximation in deep layers prior to superficial skin closure. A common choice is polyglactin (Vicryl®) which is a braided suture. Braided suture has an increased bacterial adherence up to 10 times higher than monofilament suture.<sup>21</sup> Polyglactin 910 monofilament retains 40% of its integrity at 21 days, generally holding its tensile strength for up to 3 weeks, and is absorbed at 56-70 days.<sup>22</sup> It is easy to handle but has a high coefficient of friction when sliding through tissue. Tensile strength is generally defined as the amount of horizontal tension required to break the material and can change significantly over time. For example, the tensile strength of 4-0 Vicryl has been

**Figure 1: Tray setup.** (Please note this is an example of surgical supplies commonly used for spinal cord stimulator implants but can vary based on different practice settings.)



1) needle holder; 2) loss of resistance syringe; 3) anchor suture; 4) deep closure suture; 5) irrigation; 6) Weitlaner retractor; 7) bipolar diathermy; 8) radiopaque marker; 9) Mayo (suture) scissors; 10) scalpel handles; 11) tenotomy scissors; 12) tissue forceps; 13) Gerald tissue forceps; 14) Senn retractors; 15) Army-Navy retractors; 16) Farabeuf retractors.



measured to be 13 newtons prior to immersion in tissue or solution where it might decrease by 70-80%.<sup>22</sup>

Superficial skin closure often involves staples or monofilament absorbable suture such as poliglecaprone (Monocryl®) with or without Steri Strips™ or adhesive for reinforcement. Monocryl retains 60-70% of its original strength at 7 days post-implant and 30-40% strength at 14 days post-implant.<sup>22</sup> It will dissolve no later than 4 months after implant (91-119 days). It offers high tensile strength with low tissue reactivity and, although technically absorbable, may be removed if preferred by the patient. The choice of suture or staples for superficial skin closure is left to the surgeon. Studies evaluating sutures versus staples for skin closure and their impact on SSI have demonstrated conflicting results. Staples have been associated with an increased risk of infection in some surgical settings compared to subcuticular closures.<sup>23</sup> In a meta-analysis of non-orthopedic surgeries involving more than 2,000 patients, the use of staples was associated with faster closure times (>5 minutes difference between groups), but were also associated with higher rates of infection and, in several studies, higher levels of pain.<sup>24</sup> A meta-analysis of orthopedic surgeries found higher rates of infection associated with staple closure compared to suture (relative risk 3.83), although the included studies were of poor methodological quality.<sup>25</sup> A meta-analysis evaluating skin closure techniques after total knee arthroplasty demonstrated that skin sutures had a higher likelihood of superficial and deep infections, abscess formation, and wound dehiscence.<sup>26</sup> Other considerations include efficiency (favoring staples), cost (neutral), comfort (favoring suture), and cosmetic appearance (favoring suture). Thin skin or “neurogenic” skin, commonly found in patients with spinal cord injury, may lead a surgeon to favor closure with thin, absorbable suture to preserve skin integrity. Staple closure may be associated with more superficial drainage that may be distressing to some patients. In conclusion, neither approach has been shown to be superior in terms of scar outcome or infection rates.<sup>27,28</sup>

It is important for the surgeon to identify their preference with respect to suture needle tip, but utilization may largely be driven by equipment available in their hospital or surgical center. Needle types include taper point, blunt taper point, tapercut, cutting, reverse cutting, and micro-point spatula. Type of point is left to the surgeon's preference and discretion, but cutting type points pass through tissue with less trauma. Needle shape may be straight (not generally recommended) or curved (1/4, 3/8, 1/2, or 5/8 circle).

## UNDERSTANDING SURGICAL GLUE

Skin adhesive (most commonly cyanoacrylate tissue adhesive) provides structural integrity to suture used in superficial closure and may provide a microbial barrier for up to 72 hours after closure. However, there is a low risk of skin reaction/irritation with skin adhesive that may be mistaken for an infection or allergic reaction. If cyanoacrylate tissue adhesive is used, the surgeon must first cleanse the skin after closure and take care to ensure that edges are approximated such that the adhesive does not seep into the wound. Adhesive application results in an instant seal over wound edges, and glues edges together until it peels off over the course of 7-14 days.

Surgical strips may stay in place longer if applied over skin that is first cleaned with preapplication liquid adhesive (eg, Mastisol®). Surgical strips may be used to help bolster atrophic skin as well. Sensitivity may also occur with Mastisol, and history of skin sensitivity should be elicited from patients in whom SCS implant is being considered.

## DRAPES AND SURGICAL DRESSINGS

Iodophor-impregnated drapes may reduce the risk of bacterial colonization but have not been shown to definitively decrease the risk of SSI.<sup>29</sup> NACC guidelines do not strongly support their use, but they may be considered in patients at elevated risk for SSI. Some surgeons elect to use iodophor-impregnated drapes for implants only.

In contrast, non-iodophor-impregnated drapes increase the risk for infection and are not recommended. Similarly, there is insufficient evidence to establish that silver impregnated surgical dressings reduce the risk of SSI.

## SURGICAL INSTRUMENTS

The types of surgical instruments employed are at the discretion of the surgeon. Figure 1 provides an example of tray setup.

Specific attention should be paid to surgical instrument preference for identifying and separating tissue planes. One approach that may reduce the need for cautery and improve wound healing includes employing a Weitlaner retractor to identify the natural tissue plane with the midline incision for implants. Blunt dissection can then be used as needed to facilitate anchor deployment and suturing, with instrumented dissection only employed as necessary.

## DISCUSSION

The science and practice of neuromodulation for the treatment of chronic neuropathic pain continues to evolve

as appropriate indications and patient candidacy are better understood. Although practiced for more than 50 years, the advances made in only the past 10-15 years have greatly expanded the accessibility of this therapy to appropriate patient populations.

As we seek to offer effective treatments to patients with the goal of improving pain and function, we must bear in mind the incredible clinical, humanistic, and economic costs to patients and the healthcare system. The cost of SCS-related SSI is high, with incremental annual healthcare expenditures for patients with an SCS-related SSI estimated to be nearly \$60,000 for initial implants and nearly \$65,000 for replacements.<sup>30</sup> The majority (73-77%) of infected SCS systems ultimately require explant, and most patients never undergo reimplantation.<sup>31</sup> In the international survey discussed earlier, compliance with guidelines from the Centers for Disease Control and Prevention, National Institute for Health and Care Excellence, and the Surgical Care Improvement Project was low, with only 4 of the 15 questions related to infection control practices reporting greater than 80% compliance.<sup>5</sup> In fact, only 8% of respondents were even aware that a deep SSI is defined as an infection occurring up to 365 days following an implant. The survey highlights that significant opportunity for improvement in the knowledge of best infection control practices and compliance with evidence-based guidelines.

The preceding discussion is designed to address surgical considerations when proceeding to trial and/or implantation. The development and implementation of consistent, evidence-based practices regarding infection risk mitigation, wound closure, and instrumentation is needed to effectively provide high-level surgical care. The NACC guidelines provide a helpful framework for considering best evidence-based practice for reducing infection risk.

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# Radiofrequency Ablation and Its Role in Treating Chronic Pain

When used as a treatment for chronic pain, the primary goal behind neural ablation is to interrupt and inactivate nociceptive pathways by way of creating a thermal lesion. Ablation of neural structures is not a new technology, but the application of this process continues to evolve as we develop faster, more effective, and more accurate modes of delivery. Although neural ablation can be achieved using several modalities including cryoablation and chemical neurolysis, radiofrequency (RF) is likely used most commonly by chronic pain providers. The advantages of using RF ablation include its ability to be precise and reproducible while producing long-term, but not permanent, effects. It also provides the option to stimulate neural tissue prior to ablating, thereby confirming desired target proximity while avoiding possible undesirable targets.

RF waves comprise the lowest part of the continuous electromagnetic spectrum, bound by the frequencies 3 Hz to 300 GHz.<sup>1</sup> In the procedural setting, the RF ablation needle tip acts as a cathode of an electrical circuit, which is closed by a dispersing pad placed elsewhere on the body. The electrode itself, however, does not heat up and is not hot to touch — much like a microwave does not “heat up.” The electrode generates an alternating electromagnetic field that sets nearby molecules (mostly water) into motion.

Energy lost between these molecules results in a temperature increase, which becomes the source of heat that is then transmitted farther by tissue connectivity.<sup>1</sup> While the small cross-sectional area of the needle tip creates a very high surrounding energy flux, the large cross-sectional area of the grounding pad disperses the current into a much smaller flux of energy. As a result, the thermal ablation is limited to the tissue closest to the needle tip.

Conventional radiofrequency (CRF) and pulsed radiofrequency (PRF) are two available forms of RF technology commonly used in clinical practice. While CRF applies a continuous current of electricity that heats tissues to neurodestructive temperatures of 60–80°C, PRF employs short bursts of current resulting in lower



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*“Both conventional radiofrequency and pulsed radiofrequency interventions are valuable and effective tools used to treat chronic pain, but they should be considered only when conservative measures have failed.”*

maximum temperatures of 40–42°C.<sup>2</sup> Tissue death at various temperatures are shown in Table 1. The latent periods between bursts allow heat to dissipate so that neurodestructive temperatures are not reached.

Although they use similar technology, research has shown that these two forms of ablation use two different mechanisms of action.<sup>3,4</sup>

## CONVENTIONAL RADIOFREQUENCY

The goal of CRF is to create a thermal lesion large enough to encompass the target structures while also avoiding critical ones (without creating premature desiccation). This can only be

accomplished by optimizing tissue connectivity, duration of ablation, and cathode size. Although tissue connectivity allows for the propagation of radio waves and the subsequent enlargement of the thermal lesion, it can also be a limiting factor. If the power is increased too quickly, tissues closest to the electrode become desiccated or charred as cells and their contents vaporize.<sup>1</sup> Charred tissue can no longer transmit electrical or thermal energy,

**Table 1:** Time until tissue death when exposed to various temperatures.<sup>7</sup>

Temperature	Time to Cell Death
45°C	15 min
50°C	20 secs
55°C	2 secs
100°C	< 1 sec

thereby acting as an insulator, limiting any additional extension of desired tissue destruction. Thus, thermal lesion size can be optimized by gradually heating tissues to 60–80°C for 75–185 seconds generated through an electromagnetic field with a frequency of 250 kHz.<sup>5,6</sup>

Cathode size, or the length of the needle's active tip, also plays an important role in determining the overall lesion size and shape. Whereas smaller gauge needles will create wider lesions, longer active tips will result in longer and more ovoid-shaped lesions. Commonly used instruments include 17–22-gauge RF needles with active tips ranging between 4–10 mm in size.

Targeting neural structures can be challenging, even with the use of fluoroscopy. For this reason, a larger thermal lesion is frequently desired. Methods to accomplish this include:

- Employing a smaller gauge cathode
- Utilizing a deployable dual- or V-shaped needle tip (which increases the size of the active tip without having to increase needle gauge)
- Using internally cooled electrodes that enhance slow heating of adjacent tissues, resulting in less charring and greater tissue conductivity
- Performing multiple ablations<sup>1,7,8</sup>

Once RF needle placement is confirmed by fluoroscopy, sensory and motor stimulation can be performed to assess its proximity to the target nerve. First, optimum sensory stimulation may be achieved at 50 Hz by gradually increasing voltage until pain or sensation is appreciated that is comparable to usual/targeted pain.<sup>9</sup> Thresholds between 0.3–0.9 V are generally correlated with an appropriate distance to sensory fibers while stimulation appreciated < 0.2 V may represent intraneural needle

placement.<sup>9</sup> Subsequent stimulation of motor fibers can be performed at 2 Hz using an approximate range of 1–10 V. Voltage is gradually increased to 1.5–2 times the intensity required to elicit previous sensory symptoms.<sup>10</sup> Distal muscle contractions in the face, upper extremity, or lower extremity indicate that the needle tip is near a spinal nerve and requires adjustment.<sup>11</sup>

The prolonged high temperatures employed by CRF cause coagulative necrosis to both cellular and acellular structures.<sup>12</sup> Histologically, both axonal degeneration and collagen fiber destruction of endo-, peri-, and epi-neurium structures occurs.<sup>13,14</sup> Based on the prolonged length of functional loss and damage to the nerve, CRF produces a third- or fourth-degree injury consistent with Wallerian degeneration and is associated with the potential for neuroma formation. Functional, but not complete, re-innervation of the site usually occurs over a period of months to years.<sup>15,16</sup> This typically corresponds to a return in patient's pain.

## PULSED RADIOFREQUENCY

Often presented as a less destructive alternative to CRF, PRF describes a different application of RF technology in which a 500 kHz current is applied for 2 pulses per second, with each pulse lasting 20 msec. Although transient endoneurial edema can occur, studies have shown a return to normal morphology by 7 days post-treatment.<sup>14,16</sup> This supports the conclusion that *destruction of neural elements is not thought* to be the mechanism of action of PRF. Some studies have implied that PRF alters gene expression, neuronal membrane function, and cytokine regulation.<sup>4,13</sup> Although the true mechanism remains unclear, it's been postulated that the temporary electromagnetic field created by PRF results in cellular change that favorably alters the transmission of pain signals. In any case, the effects of PRF do not fit into the Sunderland's scale of 5 degrees of nerve damage,<sup>15</sup> and additional studies are required to better understand its mechanism.

The advantages of PRF when compared to CRF are that it is significantly less painful, causes less destruction of tissues, and doesn't have the inherent risks of possible neuroma formation or deafferentation pain.<sup>18</sup> The disadvantage to PRF is that it provides a shorter duration of pain relief for patients, requiring the procedure to be repeated more frequently. The ongoing challenge associated with the mainstream use of PRF is the relative lack of randomized controlled trials supporting its efficacy. For future research, there is a distinct need for high-quality randomized controlled trials that can help identify



optimal parameters and proper nerve targets for the application of PRF in clinical practice.

## LIMITATIONS

Whether using CRF or PRF ablation, it is also important to remember that the lesions they create are relatively small compared to their neural targets and that they do not selectively destroy only nociceptive fibers. Thus, accurate placement of RF needles is paramount and requires a thorough knowledge of the target neural tissues and their associated radiographic landmarks. Complications associated with RF are usually mild and well tolerated, but they can include neuroma formation, deafferentation pain, and dysesthesia. Lastly, it should be noted that the pain relief RF provides is temporary, and thus repeat procedures should be considered and discussed as a part of the initial treatment plan.

## CONCLUSION

Both CRF and PRF interventions are valuable and effective tools used to treat chronic pain, but they should be considered only when conservative measures have failed. Although additional research is essential in determining the growing utility of RF, it currently has many applications in treating chronic pain. Therefore, it is important to educate patients and physicians about RF as an alternative and effective therapeutic option for treating chronic pain.

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# Transforming Acute Pain Management in Sickle Cell Disease: Where Are We Now?

## INTRODUCTION

Sickle cell disease (SCD) affects millions worldwide and has become a major public health dilemma in the United States. Although the national incidence is unknown, an estimated 100,000 people are believed to be affected.<sup>1</sup> In 2004, there were approximately 113,000 hospitalizations for sickle cell–related illnesses in the United States, representing an estimated \$488 billion in healthcare expenditures.<sup>2</sup>

SCD comprises a group of inherited hemoglobinopathies that cause characteristic sickling of red blood cells. Hallmarks of the disease include vaso-occlusion, chronic hemolysis, and increased adhesion of cells to the vascular endothelium, which can lead to multiorgan dysfunction and early mortality. Specifically, vaso-occlusion results in microvascular obstruction, ischemia, and tissue damage at various anatomical sites, which most commonly manifest as severe recurrent episodes of acute pain (Figure 1). Increased inflammation and alterations in nociception also play a role. The frequency, occurrence, and severity of acute pain episodes vary greatly among individuals with the disease, and patients may choose to manage episodes at home using an individualized care plan or seek medical attention. Here, we focus on inpatient management of acute pain episodes in patients with SCD.

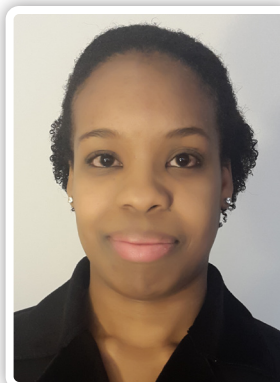
## OVERVIEW OF ACUTE PAIN MANAGEMENT

Patients who present to the emergency department or a day hospital should have rapid assessment of pain and other SCD-related comorbidities that may require treatment. Early assessment and aggressive management are paramount. Key components of the clinical assessment include the patient's report of the following.

- Pain onset
- Location
- Quality of pain
- Intensity of pain
- Similarity with prior episodes



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- Associated symptoms
- Outpatient analgesic use
- Known effective agents and doses
- Past experience with side effects

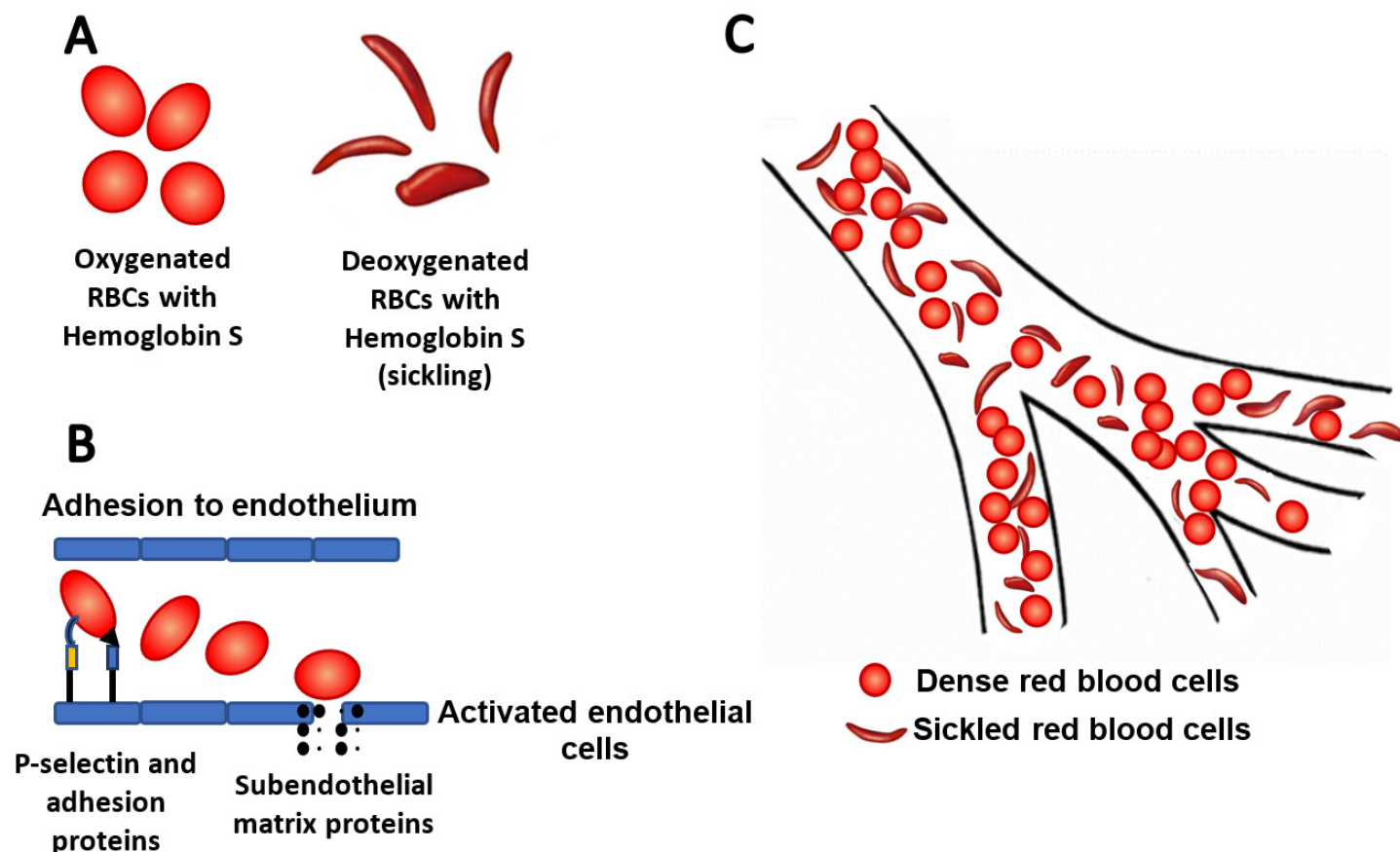
Analgesia should be provided promptly, and treatment efficacy should be assessed frequently. Individuals whose pain is not adequately treated at a day hospital or in the emergency room should be admitted to the hospital

to escalate therapy.<sup>3</sup> Primary management is pain control; however, hydration and venous thromboembolism prophylaxis should not be overlooked. Below, we summarize the available therapeutic options for acute pain episodes in SCD.

*"The future of pain management for this patient group is promising...[this could] improve morbidity, decrease hospital stays, and decrease hospitalizations."*

**Opioids.** Opioids are the mainstay of treatment for acute pain episodes in patients with SCD.<sup>3-6</sup> They include morphine, hydromorphone, and fentanyl. In most cases, patients present after inadequate pain control at home with short and/or long-acting oral opioids. Thus, intravenous therapy with scheduled dosing or continuous dosing via patient-controlled analgesia is recommended for SCD patients admitted for pain control.<sup>7,8</sup> Several challenges exist with the frequent use of opioid therapy,

**Figure 1A:** Sickling of cells with abnormal hemoglobin S during deoxygenation. **1B:** The up-regulation of P-selectin and other adhesion molecules in endothelial cells and platelets leads to abnormal rolling, slow flow and adhesion of sickle cells to vessel surfaces. **1C:** Vaso-occlusion of microvasculature by red blood cells.



particularly that of opioid tolerance and opioid-induced hyperalgesia due to N-methyl-D-aspartate (NMDA) receptor activation. Tolerance results in escalating dosage requirements over time, while hyperalgesia may require tapering opioids and a change in therapy.

**Other Treatments.** Several studies have shown promising results for non-opioid therapies as adjuncts to treatment in patients refractory to opioids. The mechanism of action of these agents are summarized in Figure 2.

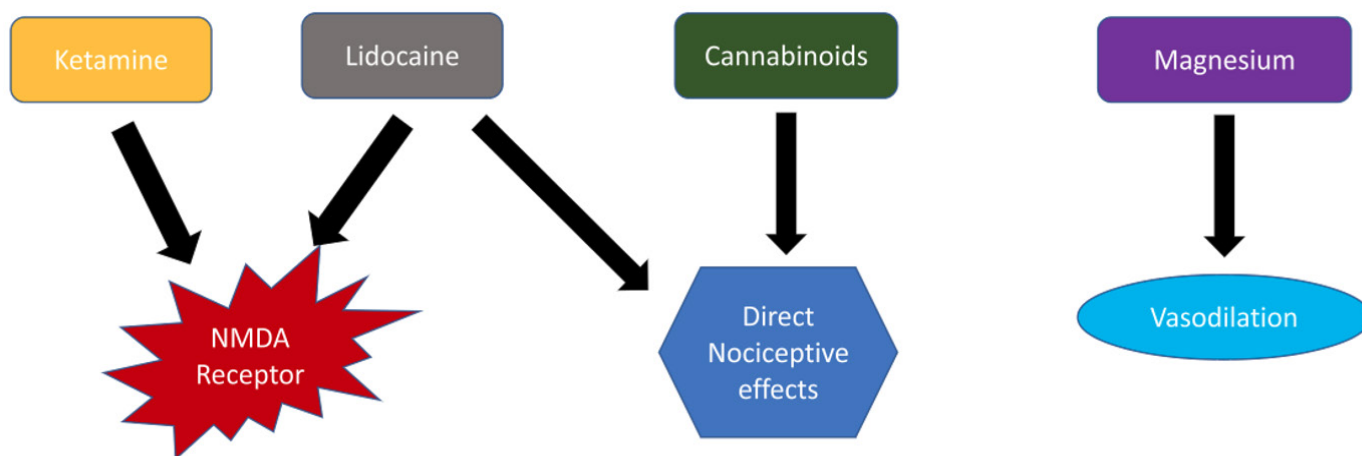
**Ketamine.** Ketamine is a noncompetitive antagonist at the NMDA receptor, which has been shown to modulate opioid tolerance and opioid-induced hyperalgesia. It also has anti-inflammatory properties<sup>8</sup> that may be specifically useful during acute pain episodes in SCD. Low (subanesthetic) doses of ketamine are considered a safe and useful adjuvant to opioid analgesia.<sup>9,10</sup> One study found that a rate of 0.1–0.3 mg/kg/h is sufficient; however,

patients with high opioid tolerance and intractable pain may require doses as high as 0.5 mg/kg/h.<sup>10</sup> Cardiovascular, respiratory, and neurologic monitoring by the bedside nurse is required during the infusion and for 1 hour after its completion.

**Lidocaine.** Lidocaine is an amide local anesthetic that inhibits NMDA and G protein-coupled receptors. In addition to analgesic properties, systemic lidocaine provides both anti-hyperalgesic and anti-inflammatory properties, which may help treat acute pain episodes refractory to opioids. Systemic lidocaine also provides relief of neuropathic pain, a major factor contributing to acute pain in SCD patients.<sup>11</sup>

**Magnesium.** In some studies, magnesium also has been shown to be effective in acute pain episodes when used in conjunction with standard treatments at a dose of 40 mg/kg (maximum dose 2.5 g) every 8 hours in the pediatric population.<sup>12</sup> Some researchers postulate that the use of

**Figure 2:** Summary of possible treatment modalities for the management of pain in vaso-occlusive crisis.



magnesium may be beneficial in SCD due to its vasodilatory action.<sup>13</sup> An effective dose in the adult population has not been ascertained, and no studies have shown a reduction of hospital length of stay in adults.<sup>14</sup>

**Cannabinoids.** Cannabinoids are active in the central nervous system and have direct effects on nociceptive pain. Therefore, cannabinoid receptor agonists may provide beneficial therapeutic effects in addition to opioids during acute pain episodes of SCD. A synergistic interaction between opioids and cannabinoid systems has been described; however, further research is required to ascertain these potentials.<sup>15</sup> These agents are thought to reduce systemic inflammation while targeting cannabinoid receptors in the central nervous system and additional opioid receptors called nociceptin receptors.<sup>16</sup> An ongoing clinical trial seeks to determine the effect of vaporized cannabis on pain and circulating inflammatory and nociceptive markers in patients with SCD (NCT01771731).

**Non-Pharmacologic Methods.** Non-pharmacologic methods can be used as adjuncts to therapy. These include the following.

- Yoga<sup>17</sup>
- Transcutaneous electrical nerve stimulation
- Warm compression
- Acupuncture
- Emotional support
- Cognitive methods such as deep breathing exercises, music therapy, distraction and cognitive behavioral therapy<sup>12</sup>

## PREVENTION OF ACUTE PAIN EPISODES

**Crizanlizumab.** Crizanlizumab is a humanized monoclonal antibody against the adhesion molecule P-selectin. The up-regulation of P-selectin in endothelial cells and platelets contributes to erythrocyte and leukocyte adhesion to vessel walls and subsequent vaso-occlusion (Figure 1B). In a recent randomized clinical trial, treatment with high-dose crizanlizumab resulted in an 45.3% lower annual rate of sickle cell-related pain crises over placebo. The median times to the first and second acute pain episode were two to three times as long in patients taking high dose crizanlizumab over placebo.<sup>18</sup>

**L-Glutamine.** Sickled red blood cells have increased levels of reactive oxygen species, and amino acid L-glutamine is needed to reduce oxidative stress. This forms the basis of a phase III randomized trial of L-glutamine powder that showed a reduced number of pain crises over 48 weeks in patients who received L-glutamine, regardless of hydroxyurea use.<sup>19</sup>

## BARRIERS TO CARE

Several studies have found that negative provider attitudes and a lack of knowledge of the standard of care contribute to barriers to effective management of acute pain episodes.<sup>20</sup> Certain aspects of managing opioid complications are unique to individuals with SCD due to the lifelong unremitting nature of the pain and chronic requirement for opioids in some individuals, resulting in opioid tolerance. Patients then require higher doses for the same effect. Many healthcare providers fear the adverse effects of opioids, particularly sedation and



respiratory failure, and want to avoid opioid abuse and diversion. This often presents barriers to adequate pain management including disbelief of pain reports,<sup>21,22</sup> reluctance to prescribe therapy, and insufficient treatment.<sup>23</sup> Unfortunately, there are no definitive ways to identify drug-seeking patients. However, multiple tools can assist in decision-making by identifying aberrant behavior related to opioid misuse, including the following.

- Web-based prescription monitoring programs allow providers to view all the patient's opioid prescriptions and evaluate aberrancies such as frequent emergency department visits, use of multiple providers, and simultaneously active opioid prescriptions.
- Urine toxicology both historically and at the time of diagnosis can determine whether the patient is taking their medications or other illicit substances.
- Self-administered screening tools can be used in the non-acute setting to identify and monitor aberrant behavior (eg, the Screener and Opioid Assessment for Patients with Pain [SOAPP or SOAPP-R] and the Current Opioid Misuse Measure [COMM or COMM-9]).<sup>24-26</sup>

Nonetheless, there is no evidence to support the misconception that the use of opioids is associated with in-hospital mortality among SCD patients in the United States.<sup>27</sup> Individuals may also present atypically and may not even appear distressed, leading to suspicion of drug-seeking behavior. Because of the episodic nature of pain in these patients, they may present for medical attention multiple times per year and be labeled as "frequent flyers." Distrust between health care providers and patients with acute pain episodes may result. This is compounded by the perception that SCD patients have higher rates of opioid addiction.<sup>28-30</sup> However, to date, there is no evidence to support this belief.<sup>30</sup>

## CONCLUSION

SCD pain is multifactorial and can be acute, chronic, or acute on chronic with numerous barriers to effective management, making treatment of acute sickle crisis extremely challenging. Opioids remain the mainstay of pain management, but this is not without adverse effects. While some adjuncts to therapy have been studied, research is still ongoing. The FDA also has approved preventive agents. All in all, the future of pain management for this patient group is promising. This could lead not only to the transformation of the standard of care but also improve morbidity, decrease hospital stays, and decrease hospitalizations.

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# Regional Nerve Blockade: What's the Long Game?

Perioperative regional nerve blockade has become a staple of anesthetic practice, particularly in academic centers and orthopedic surgical centers. Short-term benefits, such as improved pain control and decreased opioid use, are clinically apparent to many anesthesiologists and well-supported by the evidence.<sup>1</sup> Less obvious are the long-term benefits to the patient, the surgeon, and the health system. The continual quest for improvement using patient-centered outcome measures ought to remain the main driver of current and future practice. However, as we move from a fee-for-service to bundled payment reimbursement model, there will continue to be pressure for anesthesiologists to demonstrate the value provided by regional anesthetic procedures and the resources needed to support them.<sup>2</sup>

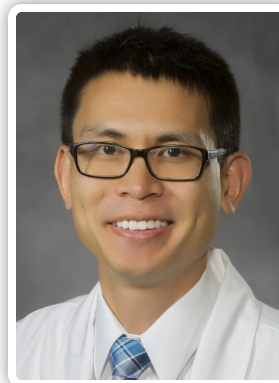
So why is it that the short-term benefits of regional anesthetics do not always translate into demonstrable long-term improvements months later? What long-term outcome measures are important? Studies evaluating outcomes months after surgery largely focus on development of persistent pain and ongoing opioid consumption. Such inquiry is important but can be fraught with confounders and may not fully highlight all the benefits to be realized through use of regional techniques. The full story may be better told by also examining effects on a broader range of outcomes, such as postoperative cognitive function in vulnerable populations, cancer recurrence, cost, OR utilization and patient satisfaction.<sup>2,3</sup> Furthermore, a careful reading of the evidence may suggest that a more selective application of continuous peripheral nerve catheters (cPNC) is needed. Strategic development of appropriate clinical pathways for cPNCs may help maximize their benefits and demonstrate the advantages many regionalists observe clinically.

## THERE ARE HIDDEN BENEFITS

The first challenge is that regional procedures offer several “hidden” benefits that are inherently difficult to quantify. These pertain to cost savings to the health system and mitigation of patient-specific anesthetic risks. For example, potential avoidance of general anesthesia and airway instrumentation in select patients remains a major advantage. Regional blockade may facilitate reduction of risk and expense associated with



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*"It is our responsibility to continue to advocate for regional anesthesia when it is in the best interest of our patients."*

special equipment or monitoring necessary for safe administration of general anesthesia in patients with challenging airways or severe systemic disease. Regional blocks also provide a valuable tool for minimizing opioids and possibly even avoiding general anesthesia in populations broadly at risk for cognitive dysfunction, such as the elderly. Lastly, the opioid-sparing effects of regional anesthesia may reduce health system costs by enabling patients with comorbidities, such as obesity or sleep apnea, to be candidates for surgery on an outpatient basis.<sup>5</sup> These

types of cost savings are not generally accounted for by conventional study design and outcome analyses.

## NOT ALL REGIONAL BLOCKS ARE CREATED EQUAL

In addition to capturing a broader set of outcomes, it is important to recognize that blending of existing data in the literature likely obscures the reality. The ability to distinguish between single-shot peripheral nerve blocks (sPNB) and cPNCs is instructive. For different reasons, both under- and overuse of continuous catheters may falsely impact the perceived benefit they have on long-term outcomes. If too many sPNBs are performed for major surgery then one might not be surprised to see

improvement in short-term, but not long-term outcomes. Furthermore, failing to differentiate these techniques could be responsible for under-reporting long-term successes of cPNCs. As has been argued elsewhere, the data may also suggest a real opportunity for current practice improvement.<sup>4</sup> Based on known mechanisms for development of chronic pain, it may be beneficial to use more cPNCs for major surgery where severe pain is expected to last longer than the analgesic duration of a single injection of local anesthetic. A selective increase in cPNC placement based on appropriate patient and/or surgical factors may increase the number of patients who can transition directly from regional nerve blockade to relatively opioid-sparing analgesic regimens. In better aligning the duration of therapy with anticipated need for pain control, a stronger clinical rationale can be made for expecting a decrease in development of chronic pain. By contrast, placing too many catheters may inflate cost without commensurate clinical benefit and may statistically dilute the real benefit of such intervention in well-selected patients. It is possible for the pendulum to swing too far in either direction, and clear data is needed to guide us.

## THE VALUE OF AN ACUTE PAIN SERVICE IS NOT WELL-STUDIED

In many centers, patients who undergo peripheral nerve blockade have the added benefit of being followed each day by the acute pain service. This team assesses pain control, functional status, and potential complications. Common practice is for inpatients to be visited at the bedside and outpatients to be contacted by phone. In our experience, these patients benefit from more robust multimodal pain regimens during hospitalization and at discharge. These interactions provide an opportunity to reinforce patient education regarding shared goals such as fall prevention and early participation in physical therapy. We anticipate long-term follow up would reflect positively on the value provided by this additional care. As a boon to the surgeon, this contact point provides an opportunity to identify and address any pressing patient concerns prior to the first postoperative visit.

Lastly, to our knowledge there are no studies in the anesthesia literature examining the long-term impact of

pre-surgical counseling on the role of regional techniques in management of postoperative pain. A comprehensive, multidisciplinary approach to preoperative pain counseling may be a potentially significant modifier of patient expectations and long-term outcomes.

## CONCLUSION

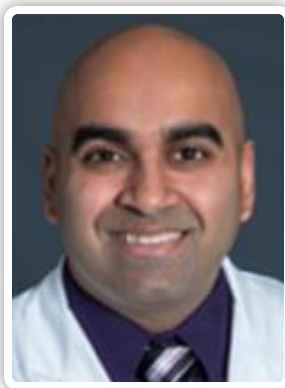
An overall lack of long-term supportive data is likely due to a combination of hidden cost savings, narrow focus on pain scores and opioid use and possibly an underutilization of cPNCs in clinical scenarios where there is high risk of persistent pain development. It is our responsibility to continue to advocate for regional anesthesia when it is in the best interest of our patients. We increase our value as regional anesthesia becomes more accessible. Experts in our subspecialty will tell us to “put local anesthetic somewhere!” as a simple motto that we can all remember. In the research arena, we should tailor our efforts in a way that accurately monitors our progress with meaningful outcomes. The long game is promising, but we must be prepared to jump the hurdles.

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# Literature Review

*Editor's note: "Literature Review" is a new feature of the ASRA News designed to provide you with brief summaries of recent articles of interest, particularly from sources that our readers might not normally consume.*



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## **"ULTRASOUND-GUIDED SUBCOSTAL TAP BLOCK WITH DEPOT STEROIDS IN THE MANAGEMENT OF CHRONIC ABDOMINAL PAIN SECONDARY TO CHRONIC PANCREATITIS: A THREE-YEAR PROSPECTIVE AUDIT IN 54 PATIENTS"**

by Niraj G, Kemal Y. In: *Pain Med.* 2020;21(1):118-24. <https://doi.org/10.1093/pm/pnz236>

### **Selection and Summary by Sudheer Potru, DO.**

Chronic pancreatitis often results in ongoing chronic abdominal pain. The pain can be because of visceral abdominal pain syndrome (VAPS) from the ongoing pancreatic

inflammation or from viscerosomatic convergence that leads to abdominal wall myofascial pain syndrome (AMPS). A total of 38 patients at a tertiary-care institution with chronic abdominal pain from chronic pancreatitis (17 with VAPS and 21 with AMPS) underwent bilateral subcostal transversus abdominis plane (STAP) blocks with depot methylprednisolone 80 mg. Clinically significant pain relief was defined as a two-point change in VAS at 3 months. Durable relief was defined as four-point change at 3 months and two-point change at 6 months. Treatment failure was described as return of pain to baseline within 4 weeks.

**Results.** 95% (20/21) of patients with AMPS who underwent bilateral STAP had clinically significant pain relief at 3 months, and 62% (13/21) of patients had durable relief. The remaining one patient reported transient pain relief (2 weeks) after STAP and proceeded to have ultrasound-guided trigger point injections, which provided clinically significant relief at 3 months. Of the 17 patients with VAPS who underwent STAP blocks, 100% failed treatment (17/17).

**Key point.** STAP blocks may be an effective option in the management of abdominal myofascial pain secondary to

chronic pancreatitis. The block is ineffective in producing clinically significant pain relief in the presence of visceral pain.

## **"THE EFFECTIVENESS OF RADIOFREQUENCY ABLATION OF MEDIAL BRANCH NERVES FOR CHRONIC LUMBAR FACET JOINT SYNDROME IN PATIENTS SELECTED BY GUIDELINE-CONCORDANT DUAL COMPARATIVE MEDIAL BRANCH BLOCKS"**

by Conger A, Burnham T, Salazar F, et al. In: *Pain Med.* 2020;21(5):902-9. <https://doi.org/10.1093/pm/pnz248>

### **Selection and Summary by Sudheer Potru, DO.**

Radiofrequency ablation (RFA) of the medial branch of the lumbar dorsal spinal nerves is typically performed for lumbar facet joint pain after successful diagnostic medial branch blocks. The threshold for proceeding to RFA has varied; some physicians require a 50% reduction in pain as a threshold, while others recommend an 80% reduction in pain. Previous studies have demonstrated prolonged relief if the 80% threshold is used, but most of these authors have only followed patients to the 1-year mark.

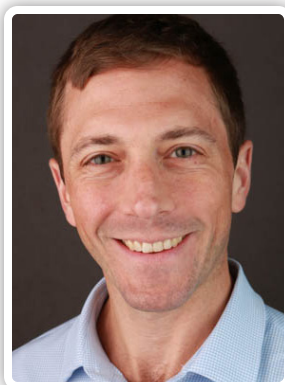
To ascertain the clinical utility and sustained benefits of the commonly used 80% pain reduction threshold following two comparative medial branch blocks prior to RFA, researchers conducted a telephone survey study of 85 patients from one institution. Outcome measurements included Numerical Rating Scale (NRS), Patient Global Impression of Change (PGIC), and report of 50% or more reduction of index pain. These outcome measurements were also evaluated in the setting of different patient characteristics that included increasing age, duration of pain, presence of scoliosis, degenerative spondylolisthesis, and >75% disc height loss.

**Results.** Patients who had undergone lumbar medial branch RFA after 80% relief from two comparative medial branch blocks showed substantial pain relief. Although the results demonstrated were not statistically significant ( $p = 0.17$ ), this resulted in >50% pain reduction in 63.2% of patients at 6 to 12 months, 65.6% at 12 to 24 months, and 44.1% at >24 months. Patient characteristics including older age and a smaller Cobb angle were associated with >50% pain reduction.

When patients were evaluated at least 6 months following RFA, >70% reported a pain reduction of two or more NRS points and >50% demonstrated a PGIC score that was "much improved" or better.



**Key point.** Lumbar medial branch RFA is an effective treatment for a substantial proportion of patients (potentially up to 44% of patients 2 years post-treatment) who undergo two sets of diagnostic medial branch blocks and obtain >80% pain relief.



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### **“TIME TO BLOCK: EARLY REGIONAL ANESTHESIA IMPROVES PAIN CONTROL IN GERIATRIC HIP FRACTURES”**

by Garlich JM, Pujari A, Debbi EM, et al. In: *J Bone Joint Surg Am.* 2020;102(10):866-72. <https://doi.org/10.2106/JBJS.19.01148>

#### **Selection and summary by Anthony Machi, MD.**

Delay in adequate analgesia for hip fracture in geriatric patients leads to worse outcomes, including increased rate of delirium and increased hospital length of stay. Regional anesthesia is an important effective component of analgesia for hip fracture endorsed by the American Academy of Orthopaedic

Surgeons. A single center, prospective cohort study was conducted in 107 patients age 60 or older who presented to the emergency department with a hip fracture and received a fascia iliaca block (FIB) between arrival and 4 hours before transfer to the preoperative holding area. Patients were enrolled from March 1, 2017, to December 31, 2017. The primary outcomes were opioid consumption and pain scores on a visual analog scale. Multiple secondary outcomes were investigated, including incidence of delirium and opioid-related adverse events, and hospital length of stay. Time to block (TTB) was defined as time from emergency department arrival to block placement, while time to surgery (TTS) was defined as time from emergency department arrival to surgical start.

**Results.** The median TTB was 8.5 hours and served to distinguish the 2 groups into early blockade (<8.5 hours) and late blockade (>8.5 hours). The mean TTS in the early blockade group was 24.9 hours, while the mean TTS in the late blockade group was 32.1 hours. Among all patients,

72% of all opioids were received prior to block placement. Patients with an earlier FIB received fewer opioids (12.0 vs 33.1 morphine milligram equivalents), had lower VAS scores for pain on postoperative day 1 (2.8 vs 3.5) and were discharged earlier (4.0 vs 5.5 days). No difference was found in incidence of delirium (20.0% vs 22.6%) or opioid-related adverse events (17.0% vs 14.8%).

**Key point.** Opioid consumption, pain, and hospital length of stay may all be reduced by early preoperative fascia iliaca blockade in geriatric patients with hip fracture.

### **“AN ILIOPSOAS PLANE BLOCK DOES NOT CAUSE MOTOR BLOCKADE—A BLINDED RANDOMIZED VOLUNTEER TRIAL”**

by Nielsen ND, Madsen MN, Ostergaard HK, et al. In: *Acta Anaesthesiol Scand.* 2020;64(3):368-77. <https://doi.org/10.1111/aas.13498>

#### **Selection and summary by Anthony Machi, MD.**

Use of peripheral nerve blockade techniques for analgesia related to hip surgery has been controversial due to the motor blockade that accompanies common techniques, such as femoral nerve and lumbar plexus blockade. This is particularly important because they can inhibit early mobilization and potentially lead to falls. The iliopectus plane block (IPB) targets the sensory branches of the femoral nerve to the hip joint; however, it is not known if this leads to motor blockade as well.

A single center, double-blinded randomized volunteer trial was conducted in June 2018 on 22 healthy subjects by performing IPB on each leg, one with a lidocaine 1.8% mixture with gadoteric acid and the other normal saline with gadoteric acid. The primary outcome measure was the decrease in maximal force knee extension 1 hour after IPB compared to baseline. Secondary outcome measures included decrease in maximal force of hip adduction, sensory testing for the distribution of cutaneous blockade, maximal force for active vs sham injectate, and assessment of the spread pattern by MRI.

**Results.** No significant decrease in maximal force knee extension or hip adduction and no decrease in sensation at the lateral thigh or at the medial patella were found. All subjects had injection in the desired IPB plane confirmed by MRI, while two subjects had evidence of intra-articular spread.

**Key point.** The iliopectus plane block may be a technique that provides sensory blockade and analgesia to the hip joint without causing appreciable motor blockade.