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Practical Regional Anesthesia: Making It Work in the Real World

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Introduction Despite many documented advantages of regional anesthesia (RA), its utilization remains at the 15-30% level in current practice.¹ Reasons cited are the additional time and expertise required for this skill, often leading to resistance by surgeons and hospitals concerned with efficiency. This review will address some of the reasons we should pursue greater application of regional techniques, as well as practical tips to improve your personal success and your institutional and surgical acceptance.

Why should we work to make it work? – Reasons to do regional more often

Although general anesthesia has become easier and safer with modern drugs and monitoring devices, regional anesthesia offers significant advantages to offset the additional work required to perform blocks.

“Old” News- There is at least one meta-analysis that suggests that intraoperative use of regional techniques can reduce mortality and morbidity², but the majority of data focuses on the improved benefits in the perioperative period when regional techniques are used or continued for post-operative analgesia. The evidence is established that epidural opioid-local anesthetic infusions provide superior post-operative pain relief compared to traditional systemic opioids after major abdominal, vascular and thoracic surgery^{3 4 5}, and appear to reduce cardiac⁶, respiratory⁷, and gastrointestinal⁸ morbidity. After major orthopedic joint replacements, nerve blocks and continuous peripheral nerve catheters consistently provide superior analgesia and improved rehabilitation for these increasingly common painful operations in our aging population^{9 10} and may even reduce hospital costs.¹¹ In outpatient surgery (now over 60% of our volumes), regional provides better analgesia and less nausea¹², and has the potential to provide faster discharge.^{13 14} The use of long-acting blocks and continuous catheters provides superior analgesia in this population also^{15 16}, and allows faster return to normal sleep and activity patterns.^{17 18}

Recent Developments- There is a suggestion that development of chronic pain¹⁹ or cancer recurrence²⁰ can be reduced when RA is used. Chronic pain is reported to develop in 10-50% of patients after hernia, thoracotomy, or breast surgery, and the incidence appears to be reduced if aggressive effective multimodal analgesia techniques (including RA) are employed compared to standard opioid therapy. More recent interest has focused on the potential role of RA in modifying cancer progression. The natural stress response to surgery inhibits cellular immunity and increases pro-angiogenic factors that may reduce resistance to cancer spread or growth. The reduction in the neuroendocrine response associated with RA may reverse these tendencies, and reports have suggested a reduction in recurrence or mortality in breast²¹, melanoma²², and colon²³ cancer operations, though the data are equivocal for prostate and other cancers; further research is ongoing.

“Breaking News”- The Centers for Medicare and Medicaid Services (CMS) has developed an incentive pay system that rewards performance on several perceived “quality measures”, including 12 clinical process based scores and 8 “patient-experienced” based scores. Thirty percent of scores used for Value Based Purchasing (VBP) are derived from 18 patient satisfaction questions, 6 of which relate to pain control experiences.²⁴ In an increasingly competitive hospital reimbursement environment, we may actually see hospital administrations (and surgeons!) expressing more interest in superior pain control regimens. Recent ASA Guidelines for Acute Pain Management²⁵ help show the path to improvement, and they include RA extensively. And many hospital administrators are asking if RA analgesia techniques can help reduce post-operative delirium and falls by avoiding opioids.

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Table 1. Meta-Analyses of Regional Anesthesia Outcomes

Overall Morbidity	Lower morbidity, 30% lower mortality	Rodgers et al., BMJ 2000 Liu, Wu, Anesth Analg 2007
Pain relief	Epidural superior, esp. thoracic	Block et al. , JAMA 2003 Wu et al, Anesthes 2005
Cardiac complications	Lower incidence of myocardial infarction with thoracic infusions	Beattie et al., AA 2001
Respiratory	Fewer complications, infections with epidural	Ballantyne et al, AA 1998
Gastrointestinal	Faster return of function	Steinbrook et al. AA 1998
Continuous Catheters	Better pain relief with catheters, faster rehabilitation in European experience	Richman et al, AA 2006 Ilfeld, AA 2011

Then Why Don't We? – Reasons Regional is Challenging

Despite these advantages, however, surveys suggest regional techniques are employed in less than 30% of surgical procedures.¹⁻²⁶ Surveys of post-operative pain scores suggest that there has been no improvement in patient analgesia despite the availability of these superior techniques in the last 15 years.²⁷⁻²⁸ Despite the superior pain relief for outpatients, nerve blocks are used in less than 15% of knee operations and less than 25% of shoulder surgeries.²⁹

As mentioned above, the main reasons are the issue of time and surgeon acceptance. Surgeon acceptance can be improved if we overcome the time issues as well as documenting the advantages listed above. A 2004 survey of Canadian orthopedic surgeons revealed that although they recognized the advantages of better pain control and fewer complications, they encouraged their patients to have regional blocks only 40% of the time, based on perceived delays in induction.³⁰ Surgeons were more likely to recommend regional anesthesia for procedures for which they themselves would prefer regional!³¹ In our practice we have found that they are more likely to accept RA when they find that they get fewer postoperative phone calls. Hopefully, we will discuss several steps that can help overcome all these issues in this presentation.

Opportunities for Improvement

There are “six p’s” that can help us improve personally, and as a team/institution.

Improve our personal proficiency. The first step for most of us is to improve our own success rates so that we are more efficient and reliable, and our surgeons are more willing to accept regional interventions. This lecture is not an attempt to improve performance on specific blocks: there are multiple presentations and workshops that provide that function in the program. Many other opportunities are also available now in terms of workshops, especially with the recent increasing popularity of ultrasound guidance for nerve blocks. Workshops and courses are available virtually every month in every corner of the country (see ASA website Calendar of Meetings, www.asra.com/education, as well as www.nysora.com).

Should you incorporate ultrasound? Nerve stimulation is still an efficient technique and traditional surface and bony landmarks are still the basis of spinal and epidural anesthesia. Ultrasound guidance has not risen to be “the standard”, but there are increasing data that it facilitates speed and accuracy of block performance,³²⁻³³ although further information is needed to assess the potential improved safety possible when the needle is visualized directly. There are now excellent reviews of ultrasound technology³⁴⁻³⁵, and a plethora of companies competing to produce high quality imaging devices. Many anesthesiologists have gained renewed confidence in blocks because of the ability to visualize the nerves, and an improved success rate when they have the chance to see “live” the variations of anatomy that may have accounted for previous failures with traditional techniques.

Some basic principles can improve success regardless of the technique used:

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a) **Plan** for success. Choose simple and reliable blocks at the start, such as spinal, femoral and axillary (and even supraclavicular with ultrasound). Avoid the complex techniques requiring a knowledge of Euclidian geometry, such as the traditional infraclavicular and proximal sciatic. Also, pick blocks that fit your surgeons' needs, such as femorals for the total knee replacements, thoracic (rather than lumbar) epidurals for upper abdominal surgery, and popliteal fossa blocks for the painful foot surgeries that benefit from prolonged analgesia. When appropriate, use fast onset local anesthetics, such as chloroprocaine or lidocaine. With lidocaine or mepivacaine, though the data are confusing, consider adding 1 mL NaHCO₃ to each 10 mL of local anesthetic to speed onset (don't try this with bupivacaine!).³⁶

b) **Prepare** yourself and your work area before doing your first attempt.

i) Know the anatomy of the nerve and its surroundings first, particularly the easily identifiable landmarks such as prominent bones (C6 tubercle for interscalene) or arteries (axillary and femoral). Review the anatomy books, websites and recent articles on techniques and hazards, and go to one of the many workshops mentioned above.

ii) Prepare your equipment beforehand. Have your drugs, gloves, trays, and resuscitation equipment all in one area on a cart so that you do not waste time assembling them (or forget an essential item).

iii) This includes a workspace, such as a block room or corner of the PACU where monitors, oxygen and equipment are available.

c) **Practice** as much as possible. Develop an efficient style. With either nerve stimulator or paresthesia technique, search for the nerve in a logical fashion, usually confining the needle movement to small steps in one plane that is perpendicular to the perceived path of the nerve (useful for interscalene, distal sciatic). Or start next to an artery (axillary, femoral) and walk in small steps away from it. For ultrasound techniques, use the "phantom" models to acquire dexterity with needle visualization, and practice scanning the anatomy on yourself, your colleagues, and your partners. More IS better.

d) Finally, **Persist**. All new technical procedures have an inevitable failure rate³⁷ on the initial learning curve, including ultrasound.³⁸ Acknowledge early failures and move rapidly to "plan B", but don't give up after the first ten attempts. Particularly, don't succumb to the temptation to try another approach – they all work pretty well when you get past the first struggles, and you will only be climbing onto the bottom rung of another learning curve!

Improve our "team" proficiency Two other "p"s

e) **Personnel** are critical. You will need help with the blocks, at several stages.

i) First, education of the patient is critical, and if it is done preoperatively, it is a great time saver. This may require enlisting your pre-anesthesia clinic staff or a partner to explain the procedure and prepare the patient before arrival. Or even on the day of surgery, a discussion before the "rushed" start of a block is helpful. In the best scenarios, your surgeon will tell the patient about the block!

ii) Secondly, you will need hands to help position, monitor, and sedate the patient, and perhaps even to inject local anesthetic when your hands are busy with needle and ultrasound probe. This may be a partner or a PACU or Admitting nurse, most of whom are very interested in participating in procedures, especially when they see it will make their job in PACU easier! Additional personnel (such as a "floating" anesthesia staff or a designated "block team" in a large or academic practice) can allow the block to start even earlier.

iii) Finally, you will need a team to follow up with your patients at home or on the wards. Creating a successful perioperative pain management program requires a 24/7 commitment, which is far easier when you have colleagues or a team nurse who are equally committed to ensuring adequate relief and correction of any defects in doses, pumps, or side effects.

f) Finally, **Processes** are essential. Success in initiating an ongoing RA program depends on procedural steps to reduce the time for placement of blocks and allow for onset of local anesthetic action. General principles for efficiency can be adapted from business models, like the "Toyota Production System" that Boeing has adopted.

i) First, create "Standard work" and expectations. Establish, for example, a pattern that "every knee replacement gets a femoral nerve block". Then the surgeon starts that discussion in his or her office, and the patient arrives expecting a block. The anesthesia pre-operative visit confirms and explains the plan, and the admitting nurse on the

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day of surgery knows that the patient needs to be on a stretcher, the team needs to be called early, and the necessary equipment is ready when the anesthesiologist arrives. The block is done in the same way, with the same equipment and drugs, every day, so the same supplies are stocked and ready. The OR, PACU, and ward nurses are not “surprised” by a numb limp extremity, and the physical therapists know to test for return of motor function before starting ambulation. Every patient has one, every care provider knows. (In our hospital, every total knee replacement receives multimodal oral analgesics, spinal anesthesia for surgery, a femoral nerve catheter that is turned off for 16 hours to allow physical therapy on POD1 and removed on POD2, and rapid transition to oral analgesics on POD1) This saves time on a daily basis, and potentially improves safety because everyone is aware of the pathway.

ii) The process must be “Transparent”. The surgeon’s pre-op orders confirm the request for the block. The anesthesia plan confirms it, documents standard information in a standard form, and has a template in the computerized orders for management of the patient monitoring, drug administration, and infusion maintenance. The process is visible and clear to all the participants.

iii) Externalizing the set-up away from operating room is essential to improving efficiency. The exact mechanism will vary depending on local situations, but there are many opportunities: the Cleveland Clinic has published their pathway for arthroplasties as one example.³⁹ A central principle is that to avoid any delays in the operating room process, the block is performed in a separate area – a block room⁴⁰, the admitting area, or a corner of the PACU where necessary monitors and equipment are already available. The use of the block room actually decreases the “anesthesia controlled time” in the operating room itself⁴¹ and does not significantly delay the transfer of the patient to the operating room.⁴² If standard equipment is ready, in many hospitals the block can be performed by the same anesthesia team while the operating room is being cleaned and instruments opened.

<p>Efficiency Steps:</p> <ol style="list-style-type: none">1) Create “standard work”2) Make the plan “transparent to the entire team3) Perform blocks away from the operating room4) Centralize equipment to block area

iv) A critical component of this process is measuring the actual times involved. In our institution, the known time for admission, IV placement, and block performance is added together and then subtracted from the anticipated time the OR will be ready, thus dictating the time the patient will arrive and the anesthesia team will start working. If this is before the previous patient leaves the OR, obviously alternative teams are needed. And a system has to be in place to signal the anesthesia technicians (or other support) to assemble the block cart and ultrasound, and call the anesthesiologist to begin the process.

Apply Efforts Efficiently – pick the best returns for the time. In the process of introducing RA into a practice where it is not used frequently, choose the procedures with the highest benefits and fewest drawbacks- the “low-hanging fruit”.

a) Frequently this is the orthopedic service, where the surgeons find that traditional analgesia limits their patients’ rehabilitation and causes many adjustments of medication (i.e., phone calls) to produce analgesia without debilitating nausea and vomiting. They are grateful if you can help, and this usually means starting with simple single-injection femoral nerve or psoas compartment blocks with long-acting drugs for total hip and knee replacements. Once this procedure is recognized to have advantages, adding a sacral nerve block to provide more effective analgesia, or a continuous catheter technique to prolong the benefits is much easier to negotiate with the orthopedic team.

b) Thoracic epidural analgesia requires more time, but is so clearly advantageous to the major vascular and thoracic surgery patient that the surgeons often request it. Expanding the use of epidural analgesia is usually dependent on the efficiency steps described above, but a post-operative pain service with epidural infusions as the mainstay is usually rapidly recognized by the ward nurses, the administration, and the surgeons as being worth the additional time required for the initial insertion for a catheter.

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c) Outpatient surgery, particularly orthopedic procedures, is another opportunity for increasing the use of regional techniques. For the painful outpatient procedures (anterior cruciate ligament repair, rotator cuff surgery, complex foot surgery, open fracture repairs), single injection femoral, popliteal fossa or interscalene blocks can again be done quickly before the procedure, and allow a comfortable first night for most patients. Initially (if a block room is not available) it is often expedient to place a block with a long-acting anesthetic and then proceed with a “quick” general or spinal anesthetic rather than waiting for the slower onset of the block. With this approach, the surgery begins rapidly, but narcotics can be avoided and patients arrive in PACU alert and pain-free, ready for rapid discharge. Again, once this advantage is recognized (as well as the risks of intraarticular infusions⁴³), many orthopedic surgeons are delighted to accept a slightly longer time for the insertion of a continuous catheter which can extend the analgesia (and the period in which they do not get phone calls for inadequate pain relief). Once these practices are in place, it becomes easier to advance the use of regional techniques to many other procedures.

Summary Regional techniques offer many advantage to our inpatients and outpatients. Simple steps to improve our efficiency and reliability can lead to greater success and surgeon and patient acceptance, and bring these documented benefits to a higher percentage of our patients. Equally important, this is an opportunity for anesthesia providers to assume a more critical and indispensable role in the medical center. As we move to an era of Accountable Care Organizations (and the concept of a “Surgical Home”) and more external estimations of the presumed “quality” of our care environment, RA can extend our visibility and impact and ensure we are part of the perceived “value” of a patient experience.

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