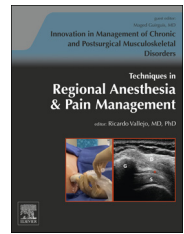


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The role of peripheral nerve block analgesia in advancing therapeutic effectiveness spanning the episode of care

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ABSTRACT

Health care reform has brought an unprecedented emphasis on attaining greater value for patients from treatment managed by individual providers and health care facilities. The value is defined as the relationship of the outcome achieved over an episode of care compared to the effort and resources employed to achieve this outcome. It is delivered when patients recover faster with fewer expensive resources, such as hospital, skilled nursing, or rehab facility stays. It is assessed by considering longer episodes of care, such as 30–180 days after performance of a procedure; and by assessing functional recovery, independence, and reintegration as a productive member of society. We review the evidence that suggests that peripheral nerve analgesia may favorably influence the value relationships described. Where insufficient or no evidence exists, we point out the need for further improvements in the pipeline of evidence for evidence-based medicine.

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Introduction

Clinical analgesic science has traditionally focused on demonstrating effectiveness of technique by assessing pain scales, opioid consumption, complications, and side effects experienced during facility stay, and other short-term outcomes. This is understandable from the view point of providers. Such data are readily available, it is conceptually and practically plausible that providers could have a major influence on such outcome parameters while patients are under the care of, for example, a nurse on the postsurgical ward, or an anesthesiologist in the operating, and immediate postanesthesia areas.

Two clinical epidemics began to transform the population of patients constituting most of patients who benefit from

surgical procedures for degenerative joint disease. With the encouragement of many professional organizations, federal health authorities and their regulatory associations, as well as the World Health Organization, pain was designated as a “fifth vital sign” and designated for expanded treatment, primarily with opiates. In time, this prompted an unprecedented rise in opioid dependency and opioid treatment-related morbidity and mortality. Opioid dependency is a predictor of slower recovery after surgery, and is associated with worse outcomes, if for no other reason that chronic pain states and opioid dependency are associated with depression.¹ The obesity epidemic that has beset western populations, including the US, has also increased the challenges encountered by patients undergoing surgical procedures. Examples include more challenging surgical exposure, less

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mobility, greater propensity toward infection, end-organ disease from associated diabetes mellitus, and greater difficulties at home shortly after major surgery. Anesthetic management and procedural care likewise are affected adversely by the presence of substantive obesity.

At the same time, American health care experienced a major shift toward outpatient surgery, shorter inpatient stays, and increased emphasis on home-based postacute care. Therefore, new analgesic therapies that could be continued after facility discharge, such as outpatient peripheral nerve catheters² were needed. Technical and scientific enhancements such as the development of multimodal analgesia and ultrasound-guided placement of blocks and catheters fueled an unparalleled expansion in clinical expertise.³ The deployment of these new capabilities have made it possible to rise to the multiple challenges of health care reform, increasing population disease burdens and opioid addiction. More evidence that peripheral nerve analgesia in particular has improved our capability to favorably influence the value of health care interventions for surgical patients is described by discussing a few common surgical indications. Where insufficient or no evidence exists, we suggest the need for further knowledge to fuel evidence-based practice. A recent patient survey done in Australia showed more than 90% satisfaction with anesthetic care that included peripheral nerve blockade, patients also were willing to repeat an anesthetic in future surgeries.⁴

Mastectomy, thoracic, and hernia surgery

Paravertebral block is frequently employed to reduce pain after these procedures. Paravertebral block reduces pain for mastectomy during the first postoperative day⁵ and reduces morphine consumption. Addition of dexmedetomidine increases the duration and improves the quality of analgesia.⁵ After outpatient breast cancer resection, ultrasound-guided paravertebral nerve blocks improved the quality of recovery for 2 days after surgery, reducing opioid consumption and improving pain scores.⁶ A meta-analysis of 14 randomized controlled trials informs on the value of this technique for hernia surgery.⁷ Compared to general anesthesia and neuraxial anesthesia, paravertebral nerve block analgesia with sedation of postoperative nausea and vomiting. Compared to neuraxial anesthesia, urinary retention was less frequently encountered. Pain control was better and the need for additional analgesics was less compared to either ilioinguinal or transversus abdominis plane blocks. Paravertebral block also reduces the development of chronic postmastectomy pain.⁸

Comparing the effectiveness of epidural and paravertebral block analgesia for the management of pain after thoracotomy, 2 meta-analyses found paravertebral nerve block to be equally effective as epidural analgesia with regard to pain control as well nausea and vomiting⁹; paravertebral nerve blocks performed better with regard to urinary retention and the evidence was equivocal with regard to postoperative hypotension.¹⁰ Compared to continuous wound catheters, Thoracic paravertebral block achieved better pain control up to 12 hours after surgery.¹¹ Yet meta-analysis shows that epidural anesthesia was associated with a reduction in

chronic postthoracotomy pain syndrome.⁸ More work is needed to address the efficacy of paravertebral blocks to prevent chronic postthoracotomy pain.

Upper extremity procedures

In a recently published systematic literature review, most regional anesthetic procedures performed for postoperative pain relief resulted in a combination of decreased pain, lower opioid requirements, or higher patient satisfaction.¹² Supraclavicular nerve block did not have such a uniformly favorable profile. There is a considerable interest to make brachial plexus block more effective to facilitate early postoperative recovery. The addition of dexamethasone to the local anesthetic has been shown to increase the duration of analgesia¹³ from supraclavicular brachial plexus block, whereas also improving surgeon “top box” (% responding with highest marks) satisfaction scores substantially.¹⁴ There is also evidence, albeit from a small number of patients, that infraclavicular continuous nerve block performs better with regard to postoperative pain relief compared to supraclavicular block. Hemidiaphragmatic paralysis from unintended phrenic nerve block is a known sequelae of brachial plexus blocks. This may result in postoperative respiratory insufficiency in high risk patients. Recent evidence indicates that ultrasound-guided supraclavicular block can avoid this complication.^{15,16} Compared to procedural sedation, ultrasound-guided supraclavicular nerve block reduced emergence department discharge time by more than 50% for patients in whom minor upper extremity procedures needed to be performed.¹⁷ More information is needed to elucidate the role of upper extremity blocks as part of a clinical pathway that results in better outcome for the episode of care such as complications, return to normal activity, and patient experience.

Lower extremity joint replacement surgery

Hip replacement surgery

The use of spinal and epidural analgesia as part of a multimodal opioid-sparing analgesic regimen has benefitted patients in allowing early mobilization. Epidural anesthesia has been used successfully for outpatient hip replacement.¹⁸ Spinal anesthesia embedded within a fast-track clinical pathway designed to optimize patient preparation, early mobilization, and hospital stay of less than 3 days showed a lower rate of postoperative cognitive dysfunction at 1 week after surgery.¹⁹ Regional anesthesia continues to be a reliable component of multimodal analgesia in rapid recovery protocols capable of reducing hospital length of stay (LOS) without increasing readmission rate.²⁰

Knee replacement surgery

Nonopioid analgesics, peripheral nerve blocks, and periarticular injections may improve pain management, rehabilitation, and patient satisfaction, while also reducing reliance on opioid medications. This multimodal approach to pain

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