



Continuous peripheral nerve blocks for outpatient orthopedic surgery: improving patient care and hospital efficiency through knowledge translation

Brian A. Pollard, MD, MEd · Celine Meschino, MD · Bijan Teja, MD, MBA · Gregory M. T. Hare, MD, PhD · Yekta Soleimani Jobaneh, BSc · Chloe Butler, MD · Ryan Khan, BA · Jeremy Hall, MD · Timothy Daniels, MD

Received: 13 January 2022/Revised: 16 February 2022/Accepted: 16 February 2022/Published online: 27 April 2022
© Canadian Anesthesiologists' Society 2022

To the Editor,

Recent clinical approaches in elective orthopedic surgery have focused on minimizing opioid requirements because of the potential risk of adverse effects, diversion of residual prescribed opioids, and long-term opioid dependence.¹ This approach to reduce dependence on opioids, while providing excellent postoperative analgesia, has been greatly supported by increased utilization of regional anesthesia,² an approach that may also improve resource utilization.³ Moreover, avoiding general anesthesia as an aerosol-generating medical procedure may improve healthcare efficiency and overall risk during the COVID-19 pandemic.^{4, 5} A recent meta-analysis² has shown that a continuous infusion of local anesthetics through a perineural catheter provides excellent analgesia,

reduces opioid utilization, and provides high patient satisfaction scores. Therefore, we implemented a continuous peripheral nerve block (CPNB) strategy to improve the overall patient healthcare experience and accessibility to care via an outpatient model while reducing cost and increasing efficiencies in hospital care.

With ethics board approval and patient consent, we initially enrolled 20 patients for shoulder ($n = 10$) and foot and ankle surgery ($n = 10$) into a peer-review funded pilot study to determine the feasibility of implementing a day-surgery model of care based on the use of CPNB for primary postoperative analgesia. We supplemented continuous outpatient local anesthetic infusions via perineural catheters with multimodal opioid and nonopioid oral medications perioperatively to facilitate same-day discharge. Data are presented as median [interquartile range (IQR)]. We performed comparisons between pain scores (analysis of variance on ranks with repeated measures) and satisfaction scores (Wilcoxon signed rank test) and assigned statistical significance at $P < 0.05$.

Patients presenting for either shoulder or foot and ankle surgery, with median [IQR] baseline preoperative pain scores of 4.8 [4.0–5.0] and 3.5 [1.3–6.0], reported immediate pain relief postoperatively with median [IQR] pain scores reduced to 0.0 [0.0–2.0] and 1.0 [0.0–4.5], respectively. Patient satisfaction scores were very high initially (median [IQR], 10.0 [10.0–10.0] and 10.0 [9.3–10.0], respectively) (Figure). Pain scores and opioid utilization remained low, and satisfaction scores remained high over a 48-h period.

Subsequent to the above pilot study, we contacted shoulder and foot and ankle surgery patients managed via CPNB (2017–2018; $N = 292$) in a quality assurance telephone survey. On postoperative day (POD) 1, patients

B. A. Pollard, MD, MEd (✉) · C. Meschino, MD · Y. S. Jobaneh, BSc · C. Butler, MD
Department of Anesthesia and Pain Medicine, St. Michael's Hospital, University of Toronto, Toronto, ON, Canada
e-mail: Brian.Pollard@unityhealth.to

B. Teja, MD, MBA
Department of Anesthesia and Pain Medicine, St. Michael's Hospital, University of Toronto, Toronto, ON, Canada

Institute for Health Policy, Management and Evaluation,
University of Toronto, Toronto, ON, Canada

G. M. T. Hare, MD, PhD
Department of Anesthesia and Pain Medicine, St. Michael's Hospital, University of Toronto, Toronto, ON, Canada

Li Ka Shing Knowledge Institute, Toronto, ON, Canada

R. Khan, BA · J. Hall, MD · T. Daniels, MD
Division of Orthopedic Surgery, St. Michael's Hospital,
University of Toronto, Toronto, ON, Canada

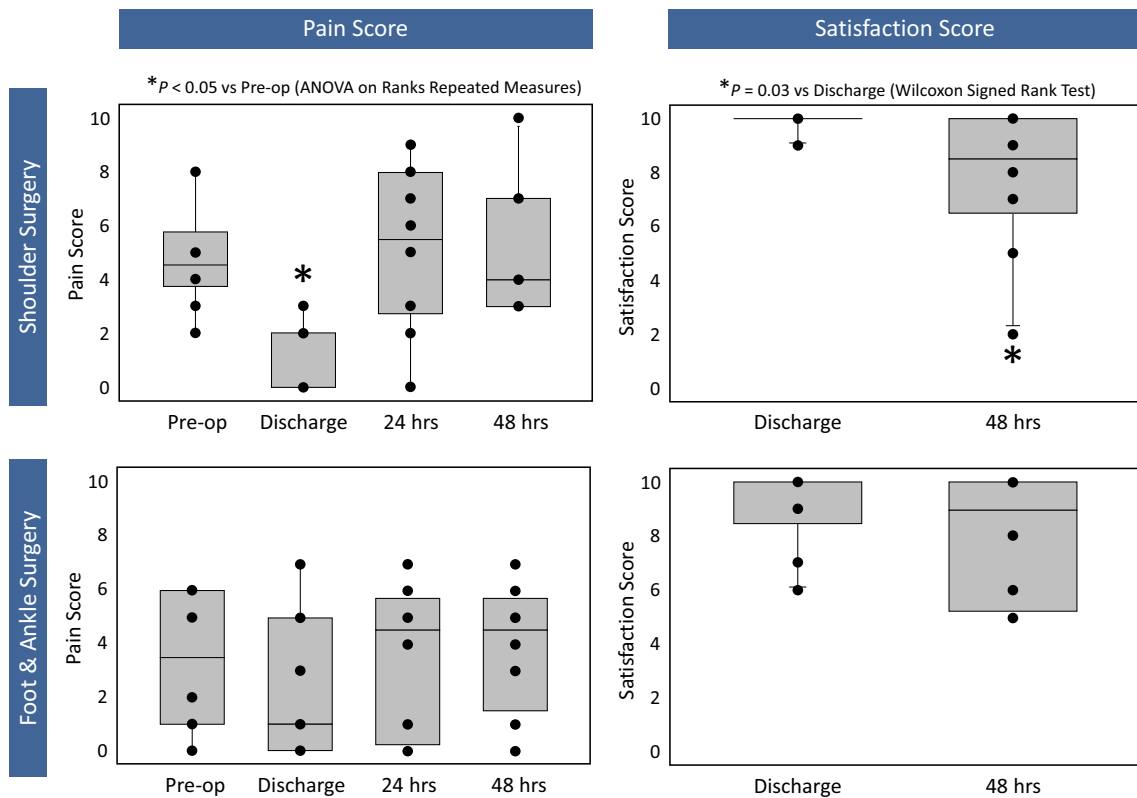


FIGURE Pain and satisfaction scores for shoulder and foot and ankle surgery preoperatively (Pre-op), at time of discharge (Discharge), and at 24 and 48 hr postoperatively (24 hr and 48 hr, respectively). The data indicate that these elective patients had significant levels of preoperative pain, that implementation of a

continuous peripheral nerve block reduced pain levels (shoulder surgery), and that postoperative pain levels were not different from preoperative levels for both types of surgery. In both cases, there was a high degree of patient satisfaction with this approach.

reported a median [IQR] numeric rating scale (NRS) pain score of 3.0 [1.0–5.0] ($n = 207$). The daily median [IQR] breakthrough hydromorphone consumption was 4.0 [0.0–8.0] mg ($n = 193$). On POD 2, patients reported a median [IQR] NRS score of 4.0 [2.0–6.0] ($n = 166$) and a breakthrough hydromorphone consumption of 4.0 [0.0–12.0] mg ($n = 153$). Peripheral sensory and motor function consistent with effective regional nerve blockade was present in 191/205 (93%) of responders on POD1 and 161/166 (97%) on POD2. Of the ankle surgery patients surveyed, 181/203 (89%) wanted to maintain their catheter on POD1, and most patients stated that they would agree to having a peripheral nerve block catheter for subsequent operations. Based on our patient care volumes and economic analysis, we estimated an overall cost savings averaging approximately CAD 2,150 per patient encounter, showing improved healthcare efficiency.

In summary, the results of our pilot study supported the feasibility to manage shoulder and ankle arthroplasty procedures with continuous peripheral nerve blocks (CPNB) in a day surgery setting. Combined with our subsequent survey, we observed high patient satisfaction,

excellent pain relief with pain scores comparable to those preoperatively, modest opioid use, and no serious adverse effects or untoward outcomes. On the basis of these results, we have subsequently expanded to performing between 300 and 700 CPNBs annually (by staff, fellows, and residents), 300 of which are performed in day-surgery patients. The longitudinal review of our outcome data continues to support the effectiveness, safety, and generalizability of this care model with respect to our initial goals. The CPNB catheter program has expanded to facilitate further implementation of a multimodal perioperative approach towards reducing the necessity of general anesthesia and reducing perioperative opioid requirement for upper and lower extremity orthopedic surgeries. This approach has also received peer-reviewed innovation funding to assess “Narcotic Free Shoulder Surgery” (St. Michael’s Hospital Association Alternative Funding Plan Innovation Fund Toronto, ON, Canada: SMHA-AFP-IF #SMH-21-018).

Disclosures None.

Funding statement Brian A. Pollard, Jeremy Hall and Timothy Daniels received research support from St. Michael's Hospital Association Alternative Funding Plan Innovation Fund (SMHA-AFP-IF #SMH 13-081) (Toronto, ON, Canada). Gregory Hare received support from a Department of Anesthesiology and Pain Medicine, University of Toronto Merit Award Program (Toronto, ON, Canada).

Editorial responsibility This submission was handled by Dr. Stephan K. W. Schwarz, Editor-in-Chief, *Canadian Journal of Anesthesia/Journal canadien d'anesthésie*.

References

1. Chan B, Ward S, Abdallah FW, et al. Opioid prescribing and utilization patterns in patients having elective hip and knee arthroplasty: association between prescription patterns and opioid consumption. *Can J Anesth* 2021; DOI: <https://doi.org/10.1007/s12630-021-02145-5>.
2. Ma HH, Chou TF, Tsai SW, Chen CF, Wu PK, Chen WM. The efficacy and safety of continuous versus single-injection popliteal sciatic nerve block in outpatient foot and ankle surgery: a systematic review and meta-analysis. *BMC Musculoskelet Disord* 2019; DOI: <https://doi.org/10.1186/s12891-019-2822-7>.
3. Mazda Y, Peacock S, Wolfstadt J, Matelski J, Chan V, Gleicher YJ. Developing a business case for a regional anesthesia block room: up with efficiency, down with costs. *Reg Anesth Pain Med* 2021; 46: 986-91.
4. Uppal V, Shanthanna H, Kalagara H, et al. The practice of regional anesthesia during the COVID-19 pandemic: an international survey of members of three regional anesthesia societies. *Can J Anesth* 2021; 69: 243-55.
5. Cherry A, Montgomery S, Brillantes J, et al. Converting hip and knee arthroplasty cases to same-day surgery due to COVID-19. *Bone Jt Open* 2021; 2: 545-51.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.