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RESEARCH PAPER

Audit improves Emergency Department triage, assessment, multi-modal analgesia and nerve block use in the management of pain in older people with neck of femur fracture

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KEYWORDS
Analgesia;
Elderly;
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Pain management

Summary
Background: The use of NBs as a mode of analgesia for #NOF in the ED is not common practice despite the reported clinical benefits of quicker onset of pain relief, decreased use of additional analgesia and decreased amounts of analgesia required when more than one mode of analgesia is prescribed.
Aim: This study aims to test the hypothesis that the implementation of educational and awareness strategies increases knowledge, and implementation of the evidence based use of nerve blocks NB's, as a mode of analgesia for elderly patients with a fractured neck of femur (#NOF) in the Emergency Department (ED).
Methods: A retrospective clinical audit of medical records using explicit chart review pre and post implementation.
Results: Implementation of educational and awareness strategies on pain management to clinical staff in the ED resulted in a significant increase in the administration of NBs, use of multimodal analgesia, and a reduction in average milligrams of morphine administrated to elderly patients with #NOF.

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Conclusions: The number of older people with #NOF presenting to the ED in Australia is increasing and historically, pain management in this group of patients could be improved. This study demonstrated that an audit, intervention and re-audit design that focused on the implementation of educational and promotional strategies informed by evidence on current and best practice standards were successful in improving delivery of analgesia to elderly patients with #NOF in the ED.

What is known?

- Patients over the age of 65 years who present to Australian Emergency Departments with a Fractured Neck of Femur (#NOF) often receive inadequate analgesia.
- The administration of nerve blocks is recommended as an adjunct analgesia in the ED.
- The use of NB in the ED, for this patient population is not common.

What this paper adds?

The implementation of Educational and awareness strategies improved pain management in one ED, for this patient population:

- improvement in the use of nerve blocks,
- improvement in the use of multimodal analgesia,
- patients who received a NB showed a significant reduction in dose of morphine received in ED,
- decrease in the patients who received no analgesia,
- increase in the use of long acting analgesia.

Introduction

Among elderly patients presenting to the Emergency Department (ED) with a fractured neck of femur (#NOF), pain experience has been reported as being undertreated and suboptimal, with many patients experiencing 'oligoanalgesia'.[1] In Australia, it has been stated that 78–86% of all ED presentations are related to pain and that the delivery of pain relief is often inadequate and inconsistent.[2] The provision of analgesia to patients with #NOF is necessary and compounded by the delivery of health care that requires patient movement, which exacerbates pain.[3–8] Relief and management of pain enable health professionals to perform a thorough medical assessment, reduce potential delays in management[2,9] and decrease suffering.[9,10]

Uncontrolled pain in this patient population has been associated with post operative complications and prolonged length of hospital stay.[4,10,11] Older patients have a reduced tolerance to pain[4,11] and are often stoic with the description of the pain they are experiencing,[12,13] that if not detected by the treating health professional, can result in inaccurate pain assessment.

Untreated pain in older people has been linked to increased anxiety, delirium, and sleep deprivation, which impacts on a patient's quality of life and recovery from illness.[1,4,14,15] Expert opinion is that pharmacodynamic changes and the physiological effects of ageing are a few determining and complicating factors when prescribing analgesia.[10–12,14–19] The presence of pre-existing co-morbidities that impact on patients' mortality and morbidity should also be considered when prescribing analgesia.[4,14,16,20]

The use of validated pain scales such as the Numerical Rating Scale (NRS) and Verbal Descriptor Scale (VDS) is recommended to subjectively assess a patients' pain.[7,11,21,22] The Alfred Health Guideline[23] on ''Assessment and Management of Acute Pain'' recommends that pain be treated at a score of 4/10 or greater, and these pain scores are used to guide analgesic interventions and track effectiveness of analgesia.[1,7,11,15,21,22,] Mortality at one year among patients post #NOF remains stable at 29–36% and is attributed not only to the injury but also to associated complications of immobility.[24–26] Among survivors, less than a third of elderly patients return to their pre-fracture level of independence.[27] A large percentage require assistance with activities of daily living, and 25% go on to require full time nursing care post their injury.[27,28]

The population of older people in Australia has increased over the last decade resulting in a higher occurrence of #NOF injuries and presentations to EDs: 17,003 in 2009 to 18,647 in 2011.[29,30] It is predicted that the population older than 65 years will increase from 12% in 2002 to 23% in 2051,[31] potentially resulting in an epidemic of hip fractures.[32,33] There has also been an increase in the average length of hospital stay and cost per episode of care for this patient group.[28,31] The impact of the increasing numbers of older people presenting to the ED with a #NOF and increasing cost of care will make the provision of quality care with adequate, timely and appropriate pain management an imperative.[1,6,14,16,30,34]

An Australian study examining the patterns of analgesia for elderly patients with #NOF in the ED suggested that introduction of local pain management strategies, including the use of NBs could improve analgesia delivery.[1] This study aimed to test the hypothesis that the implementation of educational and awareness strategies based on the evidence increases the use of NBs as a mode of analgesia for this patient population.

Background

There is a paucity of research on pain assessment and the management of patients with a #NOF in the ED. Five clinical

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guidelines and an Emergency Care Acute Pain Management Manual have been identified on the management of #NOF patients, which provide recommendations for pain management in the ED.[3,6,7,17,18,27] These publications support the administration of multi-modal analgesia and the use of NBs.[4,6,11,14,16,17] The administration of NBs as a mode of analgesia in patients older than 65 years with a #NOF is not a common practice despite the current recommendations for its use.[1,2,5–8,11,14,17,18,27,35,36]

There have been no accounts of serious complications with the administration of NBs: reported benefits are a quicker onset of pain relief and decreased use of additional analgesia including morphine.[2,4,7,14,16,37–41] Titrated opioids are reported as the most effective analgesia in relieving acute pain, but their use in older people may result in an increase of side effects, such as sedation and respiratory depression.[4–6,10,11]

Methods

This study used a retrospective observational design, and was conducted at the Emergency and Trauma Centre (E&TC), at The Alfred Hospital, Victoria, Australia. The Alfred is a major adult tertiary referral teaching hospital, with approximately 55,000 ED patient presentations annually. The study was executed in three phases, audit, intervention and re-audit and was approved by The Alfred Hospital Research & Ethics Committee. The author collected all the data for this study.

Phase 1 was a clinical audit to assess types of analgesia patients with a #NOF received in ED and proportion of patients who received a NB. Patients presenting to the E&TC at The Alfred Hospital aged 65 years or older, with primary diagnosis of #NOF were included in the study. The diagnosis of a #NOF was determined by the International Classification of Diseases[42] (ICD) and ICD code S72-Fracture of femur was used. Patients were excluded if the fracture involved mid shaft or distal femur or they had an Injury Severity Score of >14 to exclude other injuries that would influence analgesic requirements. All medical records for patients older than 65 years with a primary discharge diagnosis of ICD of S72 were reviewed from March 2010 to July 2010. Data were collected for a total of 88 patients, 18 were excluded due to missing medical or nursing documentation and presence of additional injuries.

A retrospective review of medical records was conducted through an explicit chart review using a data collection tool developed with Microsoft Excel® (Version 12.3.6, © 2007 Microsoft Corporation). Data was collected on patient demographics, documentation of pain scores using numerical rating scale (NRS), modes of analgesia used, NB administration and medical procedures. An initial pilot test on 15 medical records was performed and adaptations made to ensure reliability of the collected data.

Phase 2 comprised of a multifaceted intervention that was based on Phase 1 audit results. Deficiencies in practice identified from Phase 1 were used to implement an education and awareness raising strategy to increase knowledge of the evidence based guidance for the management of this patient group. The E&TC medical and nursing clinical leaders and senior medical and nursing staff of the hospital reviewed and approved the programme to improve compliance with best practice standards. The Director of the Orthopaedic Unit at the hospital was consulted and endorsed the proposed changes to the management of pain in elderly patients with a #NOF presenting to the ED. As emergency care is delivered via a team approach both medical and nursing staff were included in the education and awareness promotion programme.

While a range of dissemination and implementation strategies were used to facilitate the acceptance of clinical practice change, the focus was on staff being aware of current best practice standards and current E&TC level of compliance. The implementation of a programme of education and awareness raising commenced on July 16th 2012 and was delivered over a two-week period. Strategies included education on best practice standards and audit results, posters prompting staff to consider a NB for #NOF and the development and introduction of a new E&TC specific care plan, which was emailed to all staff and also available electronically on the E&TC intranet page.

The care plan for use in the E&TC was first to include both medical and nursing management for E&TC care of patients presenting with a #NOF. The use of E&TC nursing care plans for specific patient presentations such as this were familiar to staff. An Emergency Physician volunteered as a clinical champion and facilitated a 90-minute teaching session on current evidence supporting the use of NBs and the procedural requirements for NB administration. This session was delivered to all E&TC registrars, and during this session it was recommended that ultrasound be used to increase accuracy of delivery. The drug recommended was Ropivacaine 0.75%, titrated to patient's weight and diluted to a volume of 20–30 ml using the facia iliaca approach. A NB insertion pack and sticker alerting medical staff to the procedural documentation requirements was developed and implemented to assist staff in timely access to consumables required (needles, dressings, sterile packs, etc.) to perform a NB.

Phase 3 was a re-audit according to the principle of Phase 1 to assess if there was any change in clinical practice post intervention. The required sample size for Phase 3 was calculated for a difference in patients receiving a NB from 25% to 50% with a confidence interval of 95% and 80% power. The number of patients required was 66. Medical records were reviewed using the same data collection tool as in Phase 1. Data collection commenced in November 2012 and was concluded at the end of March 2013, no education or awareness strategies were provided after the initial two week education programme. A total of 87 medical records were reviewed; 21 were excluded again due to missing data and presence of other injuries affecting analgesic requirements. The re-audit commenced 16 weeks post the implementation of practice change and the final data was collected 8 months post the education programme. It was hoped that the delay in data collection would assess the uptake and permanency of level of compliance with best practice standards.

All data were analysed using Stata v 11 (College Station, Texas). Normally distributed continuous variables were described using means (standard deviation) whereas ordinal or skewed variables were described as medians (inter-quartile ranges). Statistical significance of difference between proportions were calculated using the Chi squared test or Fisher's exact test if value in a cell was <5.

Table 1 Patient demographics.

Population demographics	Phase 1 (2010) ($n = 70$)	Phase 3 (2013) ($n = 66$)
Average age (years)	83.6 (6.6)	81.9 (7.9)
Female	52 (74.3%; 95% CI: 63.0–83.1)	45 (68.2%; 95% CI: 56.2–78.1)

Table 2 Documentation of pain score at triage.

Pain score	Phase 1 ($n = 70$)	Phase 3 ($n = 66$)	p-Value
Number/10	6 (8.6%; 95% CI: 4.0–17.5)	4 (6.1%; 95% CI: 2.4–40.6)	0.67
Word used	28 (40.0%; 95% CI: 29.3–51.7)	19 (28.8%; 95% CI: 19.3–40.6)	0.17
Both number and word	34 (48.6%; 95% CI: 37.2–60.0)	23 (34.8%; 95% CI: 24.5–46.9)	0.10
None	36 (51.4%; 95% CI: 40.0–62.8)	43 (65.1%; 95% CI: 53.1–75.5)	0.10

Table 3 Documentation of pain score at initial nursing assessment.

Pain score	Phase 1 ($n = 70$)	Phase 3 ($n = 66$)	p-Value
Number/10	25 (35.7%; 95% CI: 25.5–47.4)	31 (47.0%; 95% CI: 35.4–58.8)	0.55
Word used	20 (28.6%; 95% CI: 19.3–40.0)	20 (30.3%; 95% CI: 20.5–42.2)	0.82
Both number and word	45 (64.3%; 95% CI: 52.6–74.5)	51 (77.3%; 95% CI: 65.8–85.7)	0.10
None	25 (35.7%; 95% CI: 25.5–47.4)	15 (22.7%; 95% CI: 14.3–34.2)	0.10

Statistical significance of difference between means was calculated using the Student's t-test and that between data described as medians calculated using the Wilcoxon Rank Sum test. Statistical significance was defined by a p-value of <0.05.

Results

Phase 1: pre-intervention

There were 70 patients with #NOF, who were audited in phase one (Table 1). There was no pain score documented at triage for 36/70 (51.4%) patients (Table 2). Pain score using NRS was documented for 6/70 (8.6%) patients, and 28/70 (40%) patients had the word 'pain' in the written documentation (Table 2). Documentation of pain score at initial nursing assessment occurred for 45/70 (64.3%) patients; however only 25/70 (35.7%) had a pain score was documented using the NRS (Table 3). In total 25/70 (35.7%) patients had no pain score documented during initial nursing assessment (Table 3).

NBs were administered to 17/70 (24.3%) patients (Table 4). Among patients who received a NB, 10/17 (58.8%) also received morphine (Table 5). Two or more modalities of analgesia were prescribed for 41/70 (58.6%) patients with 4/70 (5.7%) patients receiving long acting analgesia as part of their pain management (Table 6). The highest used analgesia was morphine being administered to 41/70 (58.6%) patients (Table 7). Of these patients, 15/70 (21.4%) received morphine as the only analgesia (Table 5). Paracetamol was prescribed to 32/70 (45.7%) patients and oxycodone was prescribed to 18/70 (25.7%) of patients (Table 7).

Phase 2: identifying the need for change

From the results of Phase 1 (above), three key areas of clinical practice were identified as needing change to move towards best practice in documentation of pain scores, use of NBs as a mode of analgesia, including medical documentation of the procedure, and the application of multi-modal analgesia for the management and relief of pain.

Phase 3: post-intervention

There were 66 patients enrolled in the post-intervention phase (Table 1). There was no pain score documented at

Table 4 Patients who received a nerve block.

	Phase 1 ($n = 70$)	Phase 2 ($n = 66$)	p-Value
Received nerve block	17 (24.3%; 95% CI: 15.8–35.5)	35 (53.0%; 95% CI: 41.2–64.6)	<0.01
Nerve block documented in medical record	12 (70.6%; 95% CI: 46.9–86.7)	33 (94.3%; 95% CI: 81.4–98.4)	<0.01
Documentation sticker used	N/A	18 (51.4%; 95% CI: 35.6–67.0)	<0.01

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Table 5 Morphine use compared with nerve block administration.

	Phase 1	Phase 3	*p*-Value
Received morphine	41 *n* = *70* (58.6%; 95% CI: 46.9–69.4)	42 *n* = *66* (63.6%; 95% CI: 51.6–74.2)	0.77
Average dose (mg)	6.5 (5.62)	5.3 (3.38)	0.30
Received only morphine	15 *n* = *70* (21.4%; 95% CI: 13.4–32.4)	2 *n* = *66* (3.0%; 95% CI: 0.8–10.4)	<0.01
Average dose (mg)	6.5 (7.13)	3.7 (1.77)	<0.01
Received morphine but no NB	31 *n* = *53* (58.5%; 95% CI: 45.1–70.7)	20 *n* = *31* (64.5%; 95% CI: 46.9–78.9)	0.58
Average dose (mg)	6.1 (3.6)	5.5 (3.20)	0.41
Received morphine and NB	10 *n* = *17* (58.8%; 95% CI: 36.0–78.8)	22 *n* = *35* (62.9%; 95% CI: 46.3–76.8)	0.78
Average dose (mg)	7.7 (4.63)	5.1 (3.60)	0.03
Received opioid[a] but no NB	39 *n* = *53* (73.6%; 95% CI: 60.4–83.6)	25 *n* = *31* (80.6%; 95% CI: 63.7–90.8)	0.31
Received opioid[a] and NB	13 *n* = *17* (76.5%; 95% CI: 52.7–90.4)	27 *n* = *35* (77.1%; 95% CI: 61.0–87.9)	0.96

NB: nerve block.
[a] Opioid — morphine, pethidine, fentanyl or oxycodone.

Table 6 Number of modes of analgesia patients received.

Analgesia in ED	Phase 1 (*n* = 70)	Phase 3 (*n* = 66)	*p*-Value
None	9 (12.9%; 95% CI: 6.9–22.7)	2 (3%; 95% CI: 0.8–10.4)	0.04
1 mode	19 (27.1%; 95% CI: 18.1–38.5)	14 (21.2%; 95% CI: 13.1–32.5)	0.42
2 modes	25 (35.7%; 95% CI: 25.5–47.4)	25 (37.9%; 95% CI: 27.1–49.9)	0.79
3 modes	12 (17.1%; 95% CI: 10.1–27.6)	16 (24.2%; 95% CI: 15.5–35.8)	0.31
4 modes	4 (5.7%; 95% CI: 2.2–13.8)	9 (13.6%; 95% CI: 7.3–23.9)	0.12
2 or more modes	41 (58.6%; 95% CI: 46.9–69.4)	50 (75.8%; 95% CI: 64.2–84.5)	0.03

ED: Emergency Department.

Table 7 Modes of analgesia received in Emergency Department.

	Phase 1 (*n* = 70)	Phase 3 (*n* = 66)	*p*-Value
Paracetamol	32 (45.7%; 95% CI: 34.6–57.3)	34 (51.5%; 95% CI: 39.7–63.2)	0.50
NSAIDs	2 (2.9%; 95% CI: 0.8–9.8)	3 (4.5%; 95% CI: 1.6–12.5)	0.61
Codeine	3 (4.3%; 95% CI: 1.5–11.9)	3 (4.5%; 95% CI: 1.6–12.5)	0.94
Oxycodone	18 (25.7%; 95% CI: 16.9–37.0)	28 (42.4%; 95% CI: 31.2–54.4)	0.04
Oxycontin	4 (5.7%; 95% CI: 2.2–13.8)	3 (4.5%; 95% CI: 1.6–12.5)	0.76
Pethidine	1 (1.4%; 95% CI: 0.2–7.7)	0 (–)	0.33
Fentanyl	2 (2.9%; 95% CI: 0.8–9.8)	0 (–)	0.17
Morphine	41 (58.6%; 95% CI: 46.9–69.4)	42 (63.6%; 95% CI: 51.6–74.2)	0.54
NB only	2 (2.9%; 95% CI: 0.8–9.8)	9 (13.6%; 95% CI: 7.3–23.3)	0.02

NSAID: non-steroidal anti-inflammatory drug.
NB: nerve block.

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triage for 43/66 (65.1%) patients (Table 2). Pain score using the NRS was documented for 4/66 (6%) patients, and 19/66 (28.8%) patients had the word 'pain' in the written documentation (Table 2). Documentation of pain at initial nursing assessment occurred for 51/66 (77.3%) patients; however only 31/66 (47.0%) had a pain score documented using the NRS (Table 3). In total 15/66 (22.7%) patients had no pain score documented during initial nursing assessment (Table 3).

NBs were administered to 35/66 (53%) patients (Table 4). Among patients who received a NB, 22/35 (62.9%) also received morphine (Table 5). Two or more modalities of analgesia were prescribed for 50/66 (75.8%) patients (Table 6), with 3/66 (4.5%) patients receiving long acting analgesia as part of their pain management (Table 7). The most commonly used analgesia was morphine being administered to 42/66 (63.6%) patients (Table 7). There were 2/66 (3%) patients who received morphine as the only analgesia (Table 5). Paracetamol was prescribed to 34/66 (51.5%) patients and oxycodone was prescribed to 28/66 (42.5%) of patients (Table 7).

Outcome: pre and post intervention

There was a statistically significant increase in both the use of NBs as a mode of analgesia from 24.3% to 53% ($p < 0.01$) and the medical documentation of NBs (70.5—94%, $p < 0.01$) in the post intervention phase (Table 4). There was also a subsequent statistically significant reduction in the use of morphine as the single mode of analgesia (21.4—3%, $p < 0.01$) (Table 5). The dose of morphine received by patients who had a NB also showed a statistically significant decrease (7.75—5.11 mg, $p = 0.03$).

A statistically significant decrease was shown in Phase 3 for the proportion of patients who received no analgesia (14.2—3%, $p = 0.04$) (Table 6). There was a statistically significant increase in the use of oxycodone (24—42.6%, $p = 0.04$) and multi-modal analgesia (58.6—74.2%, $p = 0.03$) in the post-intervention phase.

Discussion

This study demonstrates that a multifaceted implementation of evidence based education and awareness strategies, to the clinical staff in the E&TC achieved a significant improvement in the use of NBs as a mode of analgesia for older people presenting with a #NOF. With the increase of patients who received a NB there was a significant reduction in the average amount of morphine administered. This could be attributed to the increase in use of multimodal analgesia. Although ultrasound was recommended for the administration of NB, the consultant or registrar who performed the NB were not required to use ultrasound; the data collected for medical documentation was collected on the use of NB but did not include if ultrasound was used in the procedure.

Documentation of pain scores at triage declined in contrast with the improved pain scores documented at initial nursing assessment. At the commencement of the re-audit there was a departmental change in the process of patient assessment on arrival to the E&TC. This included the introduction of new medical and nursing documentation charts. The charts used in Phase 1 had a section to document a numerical pain score; this was absent from the chart used in Phase 3, and this is reflected in the decrease in pain score documented at triage in Phase 3. In the weeks preceding this departmental change the new national standard graphic observation chart was also introduced. The use of this chart was promoted on a daily basis, and occurred concurrently with the education and promotion strategies for the management of #NOF in the E&TC and the increase in documented pain scores at initial nursing assessment could be attributed to this new chart. The documented pain scores at triage is higher in both Phase 1 and 3 than the reported Australian average of 47.5%[1] however the documentation of pain score at initial nursing assessment in below this average in both Phase 1 and 3. The infrequent use of validated pain scales to assess, treat and re-assess a patients' pain has been highlighted by many as an area of clinical practice improvement in ED's.[4,6,11,30—32] The ongoing documentation of pain scores was not collected in this study; however it is worth noting that of the patients who had no pain scores documented in Phase 1 and Phase 3, all received analgesia.

The use of NBs reduces the need for parental analgesia, particularly opioids that have a higher risk of side effects such as sedation, respiratory depression and delirium in the elderly.[1,6,8,10,30,31,33,35,38,40,41] It has been reported that a decrease in use of opioids in this patient population has been associated with the decrease in post operative complications such as pneumonia.[4,6,27,35]

Morphine use was consistent between the two groups, and its use for the management of moderate to severe pain in the ED is recommended.[4,8,12] This study showed a significant reduction in the patients who received only morphine; and the average milligrams received was also less.

Oxycodone use increased significantly in Phase 3 and could be attributed to medical staff prescribing more that one mode of analgesia. This is also reflected in the statistically significant number of patients who received two or more modes of analgesia. The use of two or more modes of analgesia provides a greater analgesic effect than if administered alone.[2,6,9,11,30,31,40] The effect of this multimodal analgesia cannot be qualified in terms of improvements to patients' pain, as ongoing pain score documentation was not collected in this study.

The observed significant improvements could be attributed to the strategies undertaken to improve clinical practice. However our centre had already shown a greater use of NBs (in Phase 1) when compared to the 6.9% in a previous Australian study.[1] Documentation of the medical procedure showed statistically significant improvement. The introduction of the NB sticker had a high acceptance rate from the medical staff, as its format is similar to other procedural stickers used within the Emergency and Trauma Centre.

Limitations

This study was conducted by a single researcher, and was a retrospective audit of patients' medical records. The information collected from medical records relies upon the complete and accurate documentation of clinical

staff. Written documentation may not be an authentic representation of what actually occurs in clinical practice.

Although this study showed significant improvements in the hypothesis being tested (increasing the use of NB), and increases in prescribing of more than two modes of analgesia, these results are only applicable to The Alfred E&TC, where the change strategies were implemented.

Recommendations

With the estimated growth in the number of older people with #NOFs presenting to the ED and evidence that their pain management does not comply with best practice standards, exploring if there is an association between these pain management strategies in ED and improved post operative complications and length of stay, would be of benefit not only to patients but to the impact on public health costs in Victoria. A multi-centred study to evaluate the discussed changes, and the efficacy of these pain management strategies, would provide more validity to these results.

Conclusion

The number of older people with a #NOF presenting to the ED is increasing and historically, the delivery of pain management of these patients has not been in accordance with best practice standards. The application of an audit-intervention-re-audit process to the clinical review of pain management in this patient population facilitated change to clinical practice. A multifaceted programme of intervention resulted in an increase in the use of multi-modal analgesia including NBs. This study demonstrated that implementation of educational and promotional strategies informed by evidenced based best practice resulted in clinical practice change with the potential to reduce morbidity in this patient population.

Author contributions

ENB conceived and designed the study, developed the data collection tool, collected all data. LF supervised the project in partnership with ENB. BM contributed to analysis of the data. All authors contributed to the presentation of results and review of the manuscript and are in agreement with its content.

Provenance and conflict of interest

None. This paper was not commissioned.

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