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ORIGINAL RESEARCH

National audit of the quality of pain relief provided in emergency departments in Aotearoa, New Zealand: The PRiZED 1 Study

The New Zealand Emergency Medicine Network and The Shorter Stays in Emergency Department National Research Project Group*

Abstract

Objective: Pain is a common feature of ED presentations and the timely provision of adequate analgesia is important for patient care. However, there is currently no New Zealand data with respect to this indicator of care quality. The present study aimed to provide a baseline for the quality of care with respect to the provision of timely and adequate analgesia in New Zealand EDs.

Methods: The present study is a secondary analysis of data initially collected for the Shorter Stays in Emergency Department Study, using a retrospective chart review of 1685 randomly selected ED presentations (2006–2012) from 26 New Zealand public hospital EDs.

Results: Of the 1685 charts randomly selected, 1547 (91%) were reviewed from 21 EDs. There were 866 ED presentations with painful conditions, of whom 132 (15%) did not have pain recorded, 205 (24%) did not receive pain relief and 19 (2%) did not have time of analgesia documented leaving 510 (59%) for the analysis of time to analgesia. Four hundred and fifty-seven (53%) did not have pain well documented sufficiently to assess adequacy, leaving 277 (32%) for the analysis of adequacy of analgesia. The median (interquartile range) time to analgesia was 62 (30–134) min and the provision of adequate analgesia was 141/277 (51%, 95% CI: 45–57%); however, there was some variation between hospitals for both outcomes.

Conclusion: Although these outcomes are on a par with other countries, this baseline audit has shown both poor documentation and variation in the provision of timely and adequate pain relief in New Zealand EDs, with room for improvement with respect to this quality indicator.

Key words: *analgesia, emergency department, pain, quality.*

Key findings

- Pain relief is not well documented in most New Zealand EDs.
- The quality of pain relief varied significantly between different EDs.
- There is scope to improve the quality of care with respect to the provision of pain relief in New Zealand EDs.

Introduction

Between one-fourth and two-thirds of all patients presenting to the ED have pain.[1,2] The Australasian College for Emergency Medicine (ACEM) ranks severe pain in the same category of urgency to be seen as conditions that are imminently life threatening or that require time critical treatment,[3] and recommends the assessment of timeliness and adequacy of analgesia as a quality indicator for Australasian EDs.[4] International research suggests that people may wait for a long time to receive pain relief and analgesia is often not adequate in the ED,[1,5–7] together termed 'oligoanalgesia'.[8] There is currently no research on the timeliness or adequacy of pain relief in New Zealand EDs. The New Zealand Emergency Medicine Network (NZEMN) is a collaboration of Emergency Medicine clinicians and patients that has a focus on ensuring that all EDs provide a similar level of high-quality emergency care.[9] The NZEMN partnered with the Shorter Stays in Emergency Department (SSED) National Research Project (NRP) to determine whether the timeliness and adequacy of pain relief provided in New Zealand's EDs changed after the introduction of a national time target for ED length of stay.[10] The current study is a secondary analysis of this data to determine whether the quality of pain relief in EDs was similar in all EDs nationally. The primary outcome was the time to pain relief given for moderate or severe pain. The secondary outcome was the adequacy of pain relief.[11]

Methods

A retrospective chart review of a random sample of ED visits in New Zealand between 1 July 2006 and 31 December 2012, selected using a computerised random

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number generator. This time period was used for convenience as it was the time over which data was collected for the SSED NRP.[10]

All ED visits identified from New Zealand Health Information Service records for this time period were linked to District Health Board data on process times for these visits (arrival, assessment and discharge times). Case records were screened and data relevant to each participating site were collected on identical electronic data extraction forms (Microsoft Excel™, Redmond, WA, USA) by site investigators (emergency physician) or a data collector supervised by them, guided by a data dictionary. Baseline demographic information included age, sex, ethnicity and socioeconomic status using NZDep2006 (a standard measure of socioeconomic deprivation used in New Zealand based on small geographic areas of domicile), using either 10 or five categories (quintiles) with one being the lowest and five being the highest deprivation.[12] The spreadsheet contained built validation to minimise data entry errors. As pain scoring varies and was likely to be site dependent, we allowed for any 10 point rating scale or four point categorical scale (including the modified Wong-Baker and other 'faces' scales for paediatric patients).

Ethics

The SSED NRP was approved by the Multi-region Ethics Committee MEC10/06/60 and national data collection for the time to analgesia outcome as part of this study in June 2012.

Definitions

Time to analgesia was defined as the difference between the time of first medication for pain relief and the time of ED presentation. Adequacy of analgesia was defined as a reduction in the pain score by at least 2 points and to a level <4 points on a 10 point rating scale[11,13] at any time in ED. This is equivalent to moving from one severity category to the next lower and to a severity category of mild or none on a four point categorical scale. When a 10 point scale was used, mild pain was defined as 1–3, moderate as 4–6 and severe as 7–10.

Standards

We considered that all patients in severe pain should receive analgesia within 30 min of arrival. As the process of patient registration, triage, placement, initial assessment and safe administration of medication takes at best 30 min, this was considered equivalent to immediate pain relief.[6] We also considered that patients with mild or moderate pain should receive analgesia within 60 min of arrival and that all patients should receive adequate pain relief.[14]

Case selection

To be eligible, the case needed to be an ED visit with any painful condition. For both outcomes, cases were excluded if pain was not recorded. Additionally, for the primary outcome, cases were excluded if they did not receive analgesics in ED or the time of analgesic was not recorded. For the secondary outcome, cases were excluded if pain was not recorded sufficiently to calculate a difference in pain or pain was not reassessed. For between-hospital comparisons, we only included sites where at least five eligible data points were obtained.

Sample size

For this descriptive study, a formal sample size calculation was not carried out. This was a secondary analysis of data collected for a study to determine whether the time to analgesia changed after the introduction of New Zealand's SSED target.[10] A post hoc calculation of the margin of error for the proportions presented based on our sample sizes obtained for the primary outcome was 4.3% (n = 510) and for the secondary outcome was 5.9% (n = 277).

Statistical analysis

Counts, proportions with 95% confidence intervals (CIs) and medians with interquartile ranges (IQRs) were used to describe the data as appropriate to the underlying distribution. All comparisons were exploratory post hoc and hypothesis generating. Differences in time variables were tested with the Mann–Whitney U-test for two-group comparisons or Kruskal–Wallis test when there were more than two groups. The χ^2-test was used to test for differences in proportions, with the χ^2 for trend used for ordinal data. All tests were two-tailed and statistical significance was taken as $P < 0.002$ (the Bonferroni correction for multiple tests was applied to the standard $P < 0.05$ corrected for 25 tests). Data were analysed with SPSS v22 (IBM, Armonk, NY, USA).

Results

Of the 26 eligible hospitals, 21 (81%) participated in the study. This meant that 1547 of 1685 (91%) records randomly selected nationally were screened for eligibility (Fig. 1). There were 866 potentially eligible cases, 132 had no pain assessment recorded, 205 were not given analgesia (of which 10 declined) and in 19 cases there was no analgesic time recorded. This left 510 for the analysis of the primary outcome of time to analgesia. In 307 of 866 cases, pain was insufficiently recorded to allow a calculation of adequacy of analgesia and 150 with initially sufficient pain recording did not have a pain score reassessed. This left 277 cases eligible for the secondary outcome adequacy of analgesia (Fig. 1).

Baseline characteristics of the potentially eligible patients who were or were not able to be included in the analyses differed (Table 1). Although there was no difference in average age (mean difference 0.7 years [95% CI: −2.8 to 4.2 years]), those at the extremes of age were less likely to be included. Children <15 years were more likely not to have their pain recorded (46/125, 37% [95% CI: 29–46%] *vs* adults 83/741, 11% [95% CI: 9–14%]). Conversely, adults >64 years were less likely to receive analgesia when they had pain (120/219, 55% [95% CI: 48–61%] *vs* 448/647, 69% [95% CI: 66–73%] of those <65 years). Those in the most

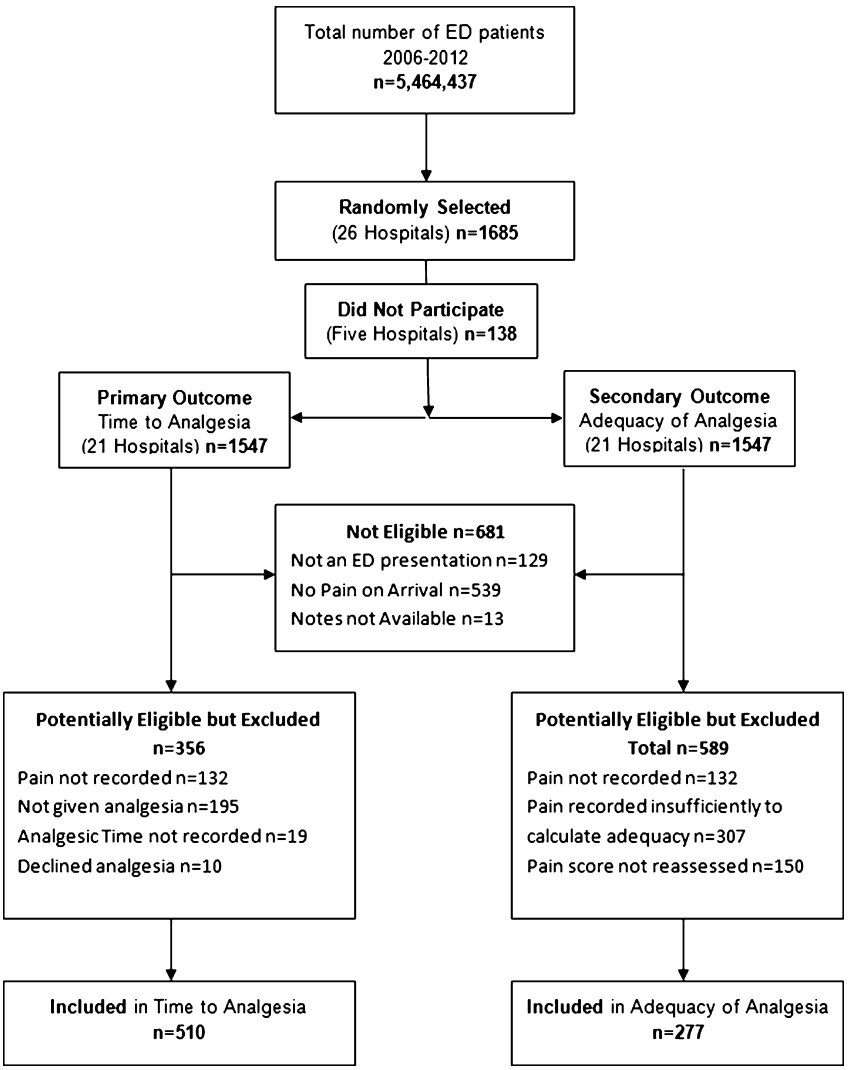

Figure 1. *Case selection.*

and least urgent triage categories were also less likely to have their pain recorded (Table 1). Pain severity was recorded in 427 of 866 (51%) of patients and those with severe pain were more likely to have time to pain relief documented than those with mild or moderate pain (Table 1). There was also no difference in the average age of those who were and were not included for adequacy of analgesia (mean difference: –2.4 years [95% CI: –6.2 to 1.2 years]). However, those under 15 years were less likely to have their pain reassessed (17/125, 14% [95% CI: 9–21%]) compared to adults (260/741, 35% [95% CI: 32–39%]). Patients assessed as higher urgency to be seen and with more severe pain were more likely to have pain reassessed (Table 1). There were no differences in the degree of social deprivation or ethnic group included or excluded from the analyses of timeliness or adequacy of analgesia.

Time to analgesia

The median (IQR) time to analgesia for patients with a documented pain score (n = 302) was 50.5 (25–107) min compared to 88 (39–188) min for those without a documented score (n = 222, P < 0.001).

Table 2 shows the median time to analgesia and proportion of patients who received analgesia within 30 and 60 min. The median (IQR) time to analgesia was 62 (30–134) min, while the proportion of all patients receiving analgesia within 30 min was 26% (95% CI: 22–30%) and within 60 min was 49% (95% CI: 45–53%). There were no differences between ethnic groups or deprivation quintiles for time to analgesia. People with severe pain received analgesia more quickly than those with mild or moderate pain (Table 2).

There were clinically important and statistically significant differences between hospitals for time to analgesia. In the 18 hospitals where five or more eligible times to analgesia were available for analysis, the median (IQR) time to analgesia ranged from 27 (10–90) to 179 (83–344) min (P < 0.001). Sixteen hospitals had five or more times to analgesia for patients with moderate or severe pain (Fig. 2). The median (IQR) times to analgesia ranged from 14.5 (9–55) to 183 (86–423) min (P = 0.001). There was no difference in time to analgesia by ED location with the median (IQR) for urban EDs being 64 (30–152) min and for regional EDs being 60 (25–114) min (P = 0.36).

Adequacy of analgesia

The proportion of all included patients receiving adequate analgesia was 51% (141/277, 95% CI: 45–57%). There was no difference in the provision of adequate analgesia for different age groups, ethnic groups, deprivation categories, sexes or pain severity (Table 2). Sixteen hospitals had five or more patients with valid adequacy calculations. In these hospitals, there was variation in the proportion patients receiving adequate analgesia, which ranged from 20% to 82.5% (P = 0.001). Fourteen hospitals had five or more patients with moderate or severe pain in whom the adequacy of analgesia could be calculated. The adequacy of analgesia for patients in these hospitals ranged from 20% to 81.8% (P = 0.002; Fig. 3).

TABLE 1. *Baseline characteristics of patients presenting to the ED with pain, according to eligibility for the primary and secondary analyses*

	Primary outcome Time to analgesia		Secondary outcome Adequacy of analgesia	
Variable	Included (*n* = 510)	Excluded (*n* = 356)	Included (*n* = 277)	Excluded (*n* = 589)
Age (years) Mean (SD)	43.5 (23.3)	44.2 (28.9)	45.5 (27.4)	43.0 (21.9)
Age category (years) *n*, % (95% CI)				
<15	53, 10 (8–13)	72, 20 (16–25)	17, 6 (4–10)	108, 18 (15–22)
15–24	84, 16 (13–20)	46, 13 (10–17)	46, 17 (13–21)	84, 14 (12–17)
25–64	263, 52 (47–56)	129, 36 (31–41)	148, 53 (48–59)	244, 41 (38–45)
>64	110, 22 (18–25)	109, 31 (26–36)	66, 24 (19–29)	153, 26 (23–30)
Female *n*, % (95% CI)	265, 52 (48–56)	176, 49 (44–55)	141, 51 (45–57)	300, 51 (47–55)
Ethnicity *n*, % (95% CI)	*n* = 501†	*n* = 351†	*n* = 274†	*n* = 579†
Māori	83, 17 (14–20)	61, 17 (14–22)	43, 16 (12–20)	101, 17 (15–21)
Pacific	52, 10 (8–13)	14, 7 (5–10)	14, 5 (3–8)	63, 11 (9–14)
European	327, 65 (61–70)	237, 68 (62–72)	196, 71 (65–75)	368, 64 (60–67)
Other	39, 8 (6–10)	28, 8 (5–10)	20, 7 (5–11)	47, 8 (6–11)
Deprivation	*n* = 468†	*n* = 341†	*n* = 256†	*n* = 553†
Median (IQR)	7 (4–9)	6 (4–9)	6.5 (4–8)	7 (4–9)
Arrival by ambulance	*n* = 484†	*n* = 342†	*n* = 264†	*n* = 562†
n, % (95% CI)	158, 33 (29–37)	97, 28 (24–33)	91, 35 (29–40)	164, 29 (26–33)
Painful condition	*n* = 510†	*n* = 356†	*n* = 277†	*n* = 589†
n, % (95% CI)				
Trauma	127, 24.9 (21–29)	78, 21.9 (18–27)	48, 17.3 (13–22)	145, 24.6 (21–28)
Non-trauma				
Non-cardiac chest pain	54, 10.6 (8–14)	57, 16.0 (13–20)	38, 13.7 (10–18)	73, 12.4 (10–15)
Cardiac chest pain	23, 4.5 (3–7)	19, 5.3 (3–8)	13, 4.7 (3–8)	29, 4.9 (3–7)
Abdominal pain	114, 22.4 (19–26)	61, 17.1 (14–21)	70, 25.3 (20–31)	105, 17.8 (15–21)
Renal colic	19, 3.7 (2–6)	3, 0.8 (0–3)	13, 4.7 (3–8)	9, 1.5 (0–3)
Headache	17, 3.3 (2–5)	8, 2.2 (1–4)	12, 4.3 (2–8)	13, 2.2 (1–4)
Other painful condition	156, 30.6 (27–35)	130, 36.5 (32–42)	71, 25.6 (21–31)	215, 36.5 (33–41)
ATS *n*, % (95% CI)	*n* = 483†	*n* = 342†	*n* = 264†	*n* = 561†
1	0, 0 (0–1)	5, 1 (0–3)	0, 0 (0–1)	5, 1 (0–2)
2	98, 20 (17–24)	60, 18 (14–22)	75, 28 (23–34)	83, 15 (12–18)
3	248, 51 (47–56)	141, 41 (36–47)	134, 51 (45–57)	255, 45 (41–50)
4	128, 27 (23–31)	119, 35 (30–40)	54, 21 (16–26)	193, 34 (31–38)
5	9, 2 (0–4)	17, 5 (3–8)	1, 1 (0–3)	25, 5 (3–7)
Pain severity *n*, % (95% CI)	*n* = 368†	*n* = 59†	*n* = 276†	*n* = 150†
Mild	93, 25 (22–29)	26, 44 (32–57)	74, 27 (21–32)	45, 30 (24–39)
Moderate	134, 36 (32–41)	23, 39 (28–52)	92, 33 (29–40)	65, 43 (34–49)
Severe	141, 38 (33–43)	10, 17 (9–29)	111, 40 (34–45)	40, 27 (21–35)
Mean score (95% CI)	5.4 (5.2–5.6)	4.2 (3.6–4.8)	5.4 (5.1–5.7)	4.9 (4.5–5.3)

†Valid = non-missing values. ATS, Australasian Triage Scale; CI, confidence interval; ED, emergency department; IQR, interquartile range; SD, standard deviation.

TABLE 2. *Timeliness and adequacy of analgesia for those receiving pain relief*

	Time to analgesia *n* = 510 Median (IQR) (min)	*P*	Analgesia ≤30 min *n* = 510 % (95% CI)	*P*	Analgesia ≤60 min *n* = 510 % (95% CI)	*P*	Adequate analgesia *n* = 277 % (95% CI)	*P*
Age (years)								
<15	60 (20–114)	0.04†	17/53 32% (21–46)	0.14†	27/53 51% (38–64)	0.12†	9/17 53% (31–74)	0.04†
15–24	60 (31–159)		21/84 25% (17–35)		42/84 50% (40–60)		14/46 30% (19–45)	
25–64	54 (26–120)		73/263 28% (23–33)		143/263 54% (48–60)		76/148 51% (43–59)	
>64	82 (35–170)		21/110 19% (13–28)		38/110 35% (26–44)		42/66 64% (52–74)	
Sex								
Female	70 (34–134)	0.17	58/265 22% (17–27)	0.03	124/265 47% (41–53)	0.33	63/141 45% (37–53)	0.04
Male	57 (24–137)		74/245 30% (25–36)		126/245 51% (45–58)		78/136 57% (49–65)	
Ethnicity								
European	61 (29–134)	0.83	88/327 27% (22–32)	0.62	162/327 50% (44–55)	0.92	100/196 51% (44–58)	0.35
Māori	62 (33–120)		17/83 20% (13–30)		41/83 49% (39–60)		19/43 44% (30–59)	
Pacific	67 (31–174)		12/52 23% (14–36)		23/52 44% (32–58)		9/14 64% (39–84)	
Other	66 (26–125)		11/39 28% (16–44)		19/39 49% (34–64)		13/20 65% (43–82)	
Deprivation quintile‡								
1	74 (26–159)	0.49†	16/54 30% (19–43)	0.48†	22/54 41% (29–54)	0.51†	15/33 45% (30–62)	0.53†
2	54 (31–98)		18/72 25% (16–36)		42/72 58% (47–69)		22/46 48% (34–62)	
3	62 (30–153)		21/82 26% (17–36)		40/82 49% (38–59)		26/48 54% (40–67)	
4	66 (33–134)		25/120 21% (15–29)		56/120 47% (38–56)		38/71 54% (42–65)	
5	73 (30–165)		34/137 25% (18–33)		61/137 45% (36–53)		29/57 51% (38–63)	
Pain severity								
Mild	62 (26–119)	0.001†	25/93 27% (19–37)	0.23†	45/93 48% (39–58)	0.004†	41/74 55% (44–66)	0.31†
Moderate	74 (30–156)		34/134 25% (19–34)		59/134 44% (36–53)		47/92 51% (41–61)	
Severe	43 (23–81)		47/141 33% (26–41)		92/141 65% (57–73)		53/111 48% (39–57)	
All	62 (30–134)		132/510 26% (22–30)	—	250/510 49% (45–53)	—	141/276 51% (45–57)	—

Statistical significance taken as $P < 0.002$ using the Bonferroni correction for multiple tests (0.05/25). †The χ^2-test for trend, otherwise uncorrected χ^2. ‡Deprivation based on NZDep2006 (1, least deprivation; 5, most deprivation). CI, confidence interval; IQR, interquartile range.

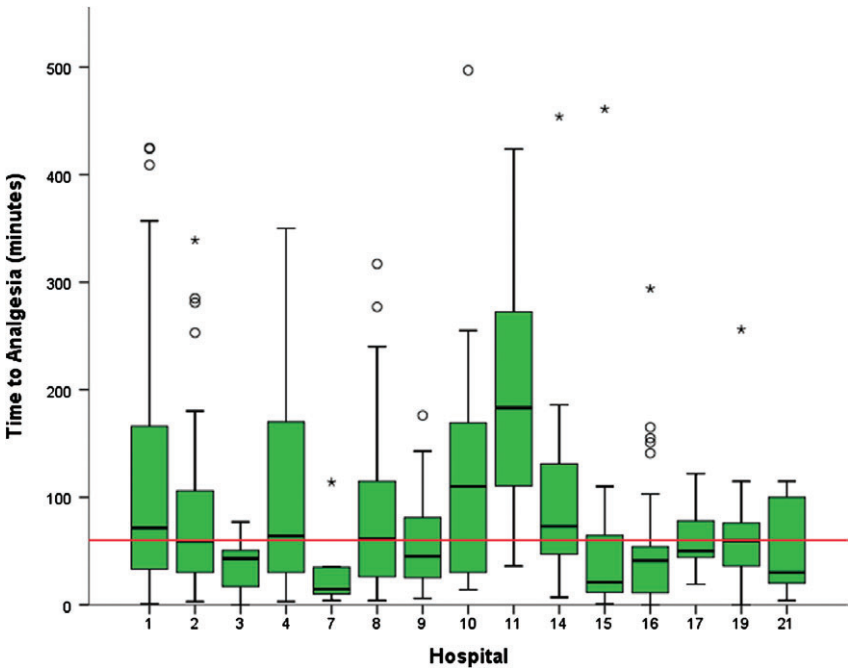

Figure 2. *Time to analgesia for moderate and severe pain by hospital. Note: Only hospitals where at least five valid times to analgesia were recorded are included. The green boxes represent the interquartile range and the black lines within the boxes are the median times to analgesia. The red line is at 60 min. Unfilled circles are outliers and asterisks are extreme outliers.*

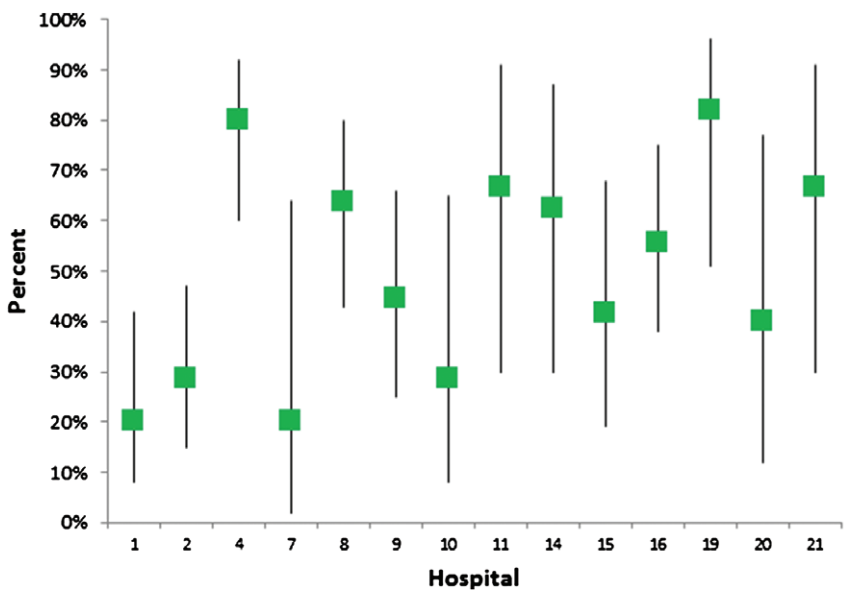

Figure 3. *Adequacy of analgesia (■) by hospital. Note: Only hospitals where at least five valid adequacy calculations were possible are included. The green boxes represent the point estimate and the black lines the 95% confidence interval for the estimate for each hospital.*

Discussion

We found that there was variation within and between EDs in New Zealand for both the timeliness and adequacy of analgesia. Only one-third of patients with severe pain received pain relief within 30 min and only half of the patients with mild or moderate pain received pain relief within an hour. Likewise, only half of the patients received adequate analgesia by the time they left ED. It is notable that these results apply only to those cases where there was appropriate documentation. In one-fourth of potentially eligible cases, patients who presented to the ED with pain did not receive any analgesia at all and most of the patients did not have a clearly documented reassessment of pain.

Although these findings are disappointing, they are consistent with international research. Historically, up to 50% of people with painful conditions were not receiving analgesics in American EDs,[7] while more recent data from Australia suggests that even with 'best practice' around 20% of people in pain do not receive analgesia when they present to ED.[11]

Australian and American research found that only around 20% of patients with severe pain receive pain relief within 30 min[6,15] and average times to pain relief were over 100 min for moderate and severe pain in the UK.[1] Recent Australian data suggest that current best practice is that the median time to analgesia for those with moderate to severe pain should be under 40 min.[11] In this study, half of the patients received adequate analgesia, which was similar to our findings.[11]

In our study, there were trends towards older people being more likely not to receive any pain relief and have delays to receiving analgesia. Oligoanalgesia for older ED patients has been previously described.[16] We found no difference in time to analgesia by sex, although there was a trend towards women being less likely to receive adequate analgesia. Prior research suggests no consistent trends with respect to sex bias in the provision of analgeics in

ED, with some authors finding bias towards women,[17,18] some against[3] and others no sex bias.[19] There was no difference in time to analgesia or adequacy of analgesia by ethnic group in our study. Some previous studies found evidence of ethnic bias in the provision of pain relief in the ED while others have not.[16,20,21] Rural location of ED has been shown to be associated with delays to analgesia,[7,15] although this was not the case in our study. Many barriers to treating pain in the ED have been identified[4,17,22] including ED crowding[23,24] and whether this is the case in New Zealand is the subject of ongoing research.[10,25]

Inadequate analgesia in EDs is a truly international problem that is multifactorial and our study shows that New Zealand shares this problem. What can we do to improve the situation? We found that pain scores were documented poorly in New Zealand EDs. Documentation of a pain score was associated with an important reduction in time to analgesia, although this may be in part because of pain scores being more likely to be documented for those with severe pain. However, this finding is consistent with prior Australian research[15] and simple interventions at a departmental level to improve pain score documentation may be a low cost action that may reduce time to analgesia in New Zealand EDs. Recent studies from Australia have shown that providing adequate analgesia improves patient satisfaction.[11,13] A very simple intervention that may improve patient satisfaction is to say to patients that 'the treatment of pain is very important and be sure to tell the staff that you have pain'.[26] More complex educational initiatives may also result in improved quality of pain care as has previously been demonstrated in Australia with the National Pain Management Initiative.[27] However, it is not always the case that such interventions will improve practice. In the USA, study time to analgesia was poor at baseline and got significantly worse after an education intervention to improve it.[6] In a cluster randomised trial in Australia, Taylor *et al.* demonstrated that an intervention designed to increase 'adequate analgesia' resulted in improved patient satisfaction; however, the intervention did not result in a decrease in the time to analgesia or the proportion receiving adequate analgesia, which may have been because of a ceiling effect, as the time to analgesia was low at baseline.[11] Eight of the departments in our study indicated that they had at some point in time had a quality improvement initiative around pain management; however, the exact timing was not available for most hospitals and so it was not possible to assess whether these influenced timely provision of adequate analgesia in the current study. It is hoped that this study will serve as the catalyst and baseline for a nationwide quality improvement project with respect to improving the provision of analgesia in New Zealand EDs.

Limitations

This was a retrospective chart review across multiple sites with multiple data collectors. Although we provided a standard electronic data collection tool with built-in validation to minimise data entry errors and an explicit data dictionary to guide data collectors, formal training and checking of the accuracy of data entry were not possible because of resource constraints. Utilising data collected over 7 years may mean that practice may have changed over time and our data may not represent a current true baseline for the outcomes we measured. However, we found no evidence that the timeliness or adequacy of analgesia changed from year to year (data not shown). Although we selected a large number of potentially eligible case records, only around 60% of these were eventually eligible for assessment of the primary outcome and <30% for the secondary outcome. This means the study was not sufficiently powered to adjust for all potential variables that may influence the outcomes and we were limited to a descriptive analysis that will serve as a baseline to inform future research. This also means that the differences we observed between hospitals for the two outcomes should be interpreted with caution as the numbers of cases able to be included at each site were relatively small.

Conclusion

The quality of acute pain relief in New Zealand hospitals appeared to vary depending on which ED people attended; however, this should be interpreted with caution as there were small numbers of cases from some sites. There is scope to improve the quality of care with respect to the documentation and provision of pain relief in New Zealand's EDs.

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Author contributions

PJ conceived the study and coordinated data collection across the sites. Data were collected by the NZEMN. The data collection tools and the data dictionary used for the study were originally created for the SSED NRP by the members of the SSED NRP Group. PJ undertook statistical analysis and drafted the manuscript. The members of both the NZEMN and SSED NRP critically reviewed and amended the draft manuscript.

Competing interests

PJ, SD and MA are section editors for *Emergency Medicine Australasia*.

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