Time to analgesia for musculoskeletal presentations in Tasmanian emergency departments: a case-controlled comparative observational study investigating the impact of advanced practice physiotherapists

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ABSTRACT

Objective. To assess the timeliness of analgesia provided to patients presenting with musculo-skeletal conditions, by advanced practice physiotherapists, medical officers and nurse practition-ers in two Tasmanian emergency departments. **Methods.** A retrospective case-controlled comparative observational study collected patient data over a 6 month period. Index cases were consecutive cases treated by an advanced practice physiotherapist, with a medical and nurse practitioner cohort case-matched based on clinical and demographic factors. Time to analgesia from initial triage and time to analgesia from patient allocation to health professional groups were analysed using Mann–Whitney U-test. Further assessment comparing between-group differences in access to analgesia within 30 and 60 min of emergency department triage was included. **Results.** Two hundred and twenty-four patients who received analgesia while in the primary care of advanced practice physiotherapists were matched against 308 others. Median time to analgesia for the advanced practice physiotherapy group was 40.5 min compared with 59 min in the comparison group (P = 0.001). Allocation to analgesia time for the advanced practice physiotherapy group was 27 min, compared with 30 min in the comparison group (P = 0.465). Access to analgesia within 30 min of presentation to the emergency department is low (36.1% vs 30.8%, P = 0.175). **Conclusion.** For musculoskeletal presentations in two Tasmanian emergency departments, patients received more timely analgesia when in the care of an advanced practice physiotherapist compared with medical or nurse practitioner care. Further improvements in analgesia access are possible, with time from allocation to analgesia a potential target for intervention.

Keywords: analgesia, hospital, model of care, performance and evaluation, physiotherapist, pharmaceuticals, workforce.

Introduction

Acute pain is a primary reason for people to present to the emergency department (ED).[1] The initial management of acute pain in the ED is multimodal, with the provision of medication playing a significant role. In the optimal environment, this medication is provided quickly and provides effective analgesia to the patient both in the ED and following discharge from hospital.[2]

Historically, the provision of care in EDs has involved medical and nursing staff. Increasingly, the implementation of alternate staffing models and associated models of care has broadened this ED team. The utilisation of advanced practice physiotherapists (APPs) to assess and manage patients with closed musculoskeletal conditions has become

commonplace in Australia.[3] APPs have increasingly become a proven part of the modern ED healthcare team, helping to improve timely access to care, reducing length of stay, improving patient flow, and providing expert musculoskeletal management.[4]

APPs have the capacity to independently manage many musculoskeletal conditions in place of medical officers or nurse practitioners. In one study, 46.5% of cases managed by an APP did not need to be assessed by a medical officer or nurse during their ED presentation.[5] However, APPs in Tasmanian EDs are unable to prescribe or administer analgesia for the patients under their care.[6] By comparison, medical officers and nurse practitioners share a scope of practice that incorporates prescription and administration of most analgesic medicines. As a result, any analgesia provided to the APP cohort required a thorough clinical handover, with subsequent prescription and administration of medication by medical officers and nursing staff. This limitation of APPs' scope of practice has the potential to delay access to analgesia for patients under their care, with APPs forced to rely on medical officers or nursing staff for medication prescription and administration.

Timely access to pain relief is one of the core indicators of quality care for patients presenting with musculoskeletal pain to the ED.[2] Currently, there is no single defined standard for time to analgesia in the ED. Some studies consider 30 min from presentation to analgesia an acceptable target,[2] while the Australian Triage Scale suggests that patients can wait up to 60 min if the severity of their pain or presentation is less severe.[7] Access to timely, adequate pain relief during an emergency presentation can reduce patient distress, anxiety[8] and improve overall satisfaction.[9]

There is limited published evidence related to access to analgesia for patients presenting with pain in Australian EDs. Work by Jennings *et al.* demonstrated that patients who received analgesia from a nurse practitioner waited a median of 60 min from triage to analgesia administration, while the median time to analgesia after initial allocation to a nurse practitioner was 25 min.[10] Work by Alkhouri *et al.* suggested that APPs across multiple New South Wales sites reduced the average time to analgesia by 18 min compared with medical officer or nurse practitioner models of care. Significantly, APPs in Tasmania and New South Wales work with similar prescribing-related regulatory restrictions.[11]

The primary aim of this study was to assess the timeliness of first analgesia for patients with musculoskeletal complaints assessed and managed by APPs, compared with medical officer or nurse practitioner, in two Tasmanian emergency departments.

Secondary aims included assessment of the impact of time to allocation (to a treating health professional) on timeliness to analgesia, the percentage of patients who received analgesia within 30/60 min access benchmark targets and a between-group comparison of the formulary of medicines used for musculoskeletal presentations.

Methods

We conducted a case-controlled comparative observational study of patients presenting to two Tasmanian emergency departments between May and November 2021.

Patients who presented to either site during hours staffed by APPs (9 am–7 pm), with closed musculoskeletal presentations were included. Cases included people who had clinicians who were doctors, nurse practitioners or APPs. Only patients who received analgesia were included in the final analysis. Patients were excluded if they were less than 5 years of age or if they were admitted to hospital following the presentation. Patients who received analgesia prior to allocation were excluded from the allocation to analgesia administration analysis. Furthermore, patients were excluded if full data were not available for analysis.

Data collection

Data collection occurred from 1 August 2022 to 31 October 2022 by two authors (DJ and CB). Patients were identified from TrakED (ED tracking and patient-related information technology system), and data were extracted from the patient's digital medical record.

Data were collected in four main categories: demographic and diagnostics, clinician (profession) data, timeliness data regarding service characteristics, and medication.

Demographic and diagnostic data included age, gender, triage category, region of primary complaint (upper, lower limb or spinal) and severity of injury (fracture/dislocation or soft tissue injury). Clinician-specific data focused on clinician profession (medical officer, nurse practitioner or APP). No data were collected related to the experience level of clinicians. Timeliness data included triage time, time of staff allocation, time of analgesia administration and time of discharge. Triage time was defined as the time of clerking upon initial presentation in the ED. Time of allocation was defined as the time at which a health practitioner was assigned to the patient. Time of analgesia administration was defined as the time documented next to the prescribed medication on the national inpatient medication chart (NIMC). Time of discharge was defined as the time the patient left the department. Medicine-specific data refer to analgesia administered in the ED as documented on the NIMC.

Case matching

Case matching was manually undertaken by the lead author (DJ). Patients in the medical officer or nurse practitioner groups were matched to the APP cohort based on gender, age (±5 years), Australasian triage category, body region affected (upper limb, lower limb or spinal) and musculoskeletal diagnosis (fracture/dislocation vs sprain).

To develop the final cohort for between-group comparison, duplicates (cases matched to both medical officer and nurse practitioner groups) and unmatched cases were removed from the APP cohort.

Data analysis

Descriptive statistics were used to provide demographic information and compare groups in terms of matched cases (i.e. for age, gender, triage score, body region). Data from each site were collected, with the primary and secondary analysis an amalgamation of both sites.

The primary analysis was a two-group comparison assessing median time from triage to analgesia administration for patients assessed/managed by an APP and those by a medical officer or nurse practitioner to investigate the impact on access to analgesia for patients. To meet the secondary aims, the median time from triage to allocation, allocation to analgesia administration and triage to discharge were compared between APP and medical officer or nurse practitioner.

The primary outcome was assessed on a continuous scale (in minutes), with time to analgesia unlikely to be normally distributed.[12] As such, Wilcoxon Mann–Whitney *U*-tests were used to assess all time-based between-group comparisons.[13]

To explore the frequency of meeting 30/60 min access benchmark targets for timely access to analgesia, further analysis was completed by converting continuous data into dichotomous data (achieved/not achieved within boundary), for both the 30 min and 60 min targets.

To address the final secondary aim of comparing rates of administration of simple analgesia (paracetamol and ibuprofen/other non-steroidal anti-inflammatory drug) and opioid analgesia (oxycodone/tramadol/morphine/fentanyl) between clinician groups, the proportion of patients receiving each subgroup was analysed using a two independent sample *t*-test. This enabled comparison between APP and medical officer/nurse practitioner groups.

Sample size

The sample size was calculated to identify a 10 min between-group median difference between APP and combined medical officer or nurse practitioner groups (alpha = 0.05 and power = 0.9), using the Wilcoxon Mann–Whitney *U*-test.

Assumptions of a median APP time to analgesia of 45 min (with a standard deviation of 40 min) were based on unpublished pilot work by the primary author (DJ) at a similar-sized institution with a similar APP prescribing scope of practice. The calculated sample size required was 507.

Consecutive patients seen by APPs across both sites during the study period were included in the APP cohort. Given an expected challenge of identifying matched cases to the APP cohort, we planned to collect approximately 400 cases from medical officer and nurse practitioner cohorts across each site, who met the inclusion and exclusion criteria and matched the APP scope of practice.

Ethics approval was obtained from the University of Tasmania (HREC No. 27308).

Results

A total of 18 200 patient records were reviewed for inclusion across the two sites. Table 1 shows how the final eligible patient groups were determined. The analysis included a total of 532 participants with 312 from site 1 and 220 from site 2. This included 224 patients managed by APPs, 160 managed by medical officers and 148 managed by nurse practitioners. A total of 149 patients who received analgesia prior to allocation were excluded from the allocation to analgesia administration analysis.

The matched cases were similar with regard to baseline characteristics at each site (Table 2). A total of 90.6% of patients seen were assigned an Australian triage category of 4 or 5. A total of 94.5% of patients across both groups presented with peripheral musculoskeletal complaints.

Patients who were assessed and managed by APPs received analgesia earlier than those managed by a medical officer or nurse practitioner. The median difference in time from triage to administration of analgesia when comparing APPs to a medical officer or nurse practitioner was 18.5 min (40.5 min vs 59 min, $P < 0.001$). When considering the

Table 1. Cohort flowchart of the number of patient records assessed at each stage of the study.

	APP-1	MO-1	NP-1	APP-2	MO-2	NP-2
Patients reviewed	493	7512	1245	583	7189	1178
Within APP scope	493	531	450	583	481	366
Received analgesia	150	257	212	224	127	100
Matched APP cohort	128	95	106	113	73	65
Excluded (NIMC errors)	1	1	15	16	7	8
Final inclusion	127	94	91	97	66	57

Number next to each professional group denotes the site. APP, advanced practice physiotherapist; NP, nurse practitioner; MO, medical officer.

Table 2. Baseline demographic and clinical data from each professional group at each site.

	APP-1	MO-1	NP-1	APP-2	MO-2	NP-2
No. of patients	127	94	91	97	66	57
Pre-allocation nurse-initiated analgesia	25	31	20	19	13	41
Age (years), mean	29.6	27.6	26.6	33.4	34.2	36.0
Gender (no. male)	80	59	52	40	28	20
Triage category 3	15	12	12	5	5	1
Triage category 4	85	67	61	87	59	52
Triage category 5	27	15	18	5	2	4
Upper limb injuries (no.)	55	37	46	39	32	19
Lower limb injuries (no.)	64	51	41	54	30	36
Spinal injuries (no.)	8	6	4	4	4	2
Fractures/dislocations (no.)	49	29	40	40	25	14

Table 3. Access to analgesia, allocation, and discharge between APP and MO/NP groups.

	Profession	Median (IQR) min	Between group difference
Primary analysis			
Triage to analgesia	APP	40.5 (23.75–67.25)	18.5 min
Administration	MO/NP	59 (22–98)	$P < 0.001$, $U = 28\,440$
Secondary analysis			
Triage to allocation	APP	16 (9–35)	25 min
	MO/NP	41 (16.5–74.25)	$P < 0.0001$, $U = 21\,836$
Allocation to analgesia	APP	27 (17–47.5)	3 min
	MO/NP	30 (15–61)	$P = 0.465$, $U = 18\,000$
Triage to discharge	APP	102 (77–134)	56 min
	MO/NP	158 (100–226)	$P < 0.0001$, $U = 21\,756$

impact of clinician allocation, patients seen by an APP were allocated 25 min earlier compared with the medical officer/ nurse practitioner groups (16 min vs 41 min, $P < 0.0001$). A total of 388 patient records were included in the allocation to administration of analgesia analysis. No significant difference in time from allocation to analgesia was identified between groups (27 min vs 30 min, $P = 0.465$). The total median ED length of stay was reduced by 56 min when patients were managed by an APP compared with those managed by a medical officer or nurse practitioner (Table 3).

When comparing the percentage of patients who received analgesia within 30 min of triage, no difference between the cohorts was identified. Within 60 min, however, there was a statistically significant difference in favour of those managed by an APP (Table 4).

Paracetamol and/or ibuprofen was prescribed and administered in 333 of 369 patients (90.2%) in the APP cohort.

Table 4. Analgesia received within threshold in both the APP and MO/NP groups.

	APP	MO/NP	Difference
Number of patients	224	308	
Within 30 min N (%)	81 (36.1%)	94 (30.5%)	5.6% (−2.4% to 30.7%)
			$P = 0.175$
Within 60 min N (%)	155 (69.2%)	156 (50.6%)	18.6% (5.4–18.7%)
			$P = 0.006$

Note: values in parenthesis in the difference column are 95% CI.

The increased use of ketorolac was the only significant between-group difference in medication administered, comprising 5.2% of medication administered in the medical officer/nurse practitioner group (Table 5).

Table 5. Medications prescribed and administered.

Group	Drug	APP	MO/NP	Difference in proportion[A]	P-value
Simple	Paracetamol	180	225	7.2% (−0.1 to 14.2%)	0.05
	Ibuprofen	153	199	3.7% (−4.5 to 11.6%)	0.37
	Ketorolac	1	27	−8.8% (−5.6 to −12.4%)	<0.001
Opioid	Panadeine Forte	12	21	1.8% (−2.5 to 5.8%)	0.39
	Oxycodone	23	47	−5.0% (−0.9 to 10.6%)	0.09
	Morphine	0	1	Not assessable	N/A

[A]Positive percentages represent higher proportions in the APP cohort, while negative percentages represent higher proportions in the NP/MO cohort.
Note: values in parenthesis in the difference in proportion column are 95% CI.

Discussion

In this retrospective case-controlled comparative observation study, we found that patients who presented to two Tasmanian EDs with musculoskeletal conditions received analgesia 18.5 min earlier when allocated to an APP compared with care provided by medical officer or nurse practitioner. Significantly, patients are 18.6% more likely to receive analgesia within 1 h if seen by an APP. These results are a consequence of earlier allocation to APP care, with this cohort receiving care 25 min earlier than those in the comparison group. Allocation to analgesia administration took a similar period of time, between 27 and 30 min for APP and medical officer/nurse practitioner groups, respectively. These results are in keeping with previous Australian research focused on analgesia access in EDs. Alkhouri *et al.* reported an 18 min improvement in analgesia administration because of APP care,[11] while Jennings *et al.* reported a time from allocation to analgesia administration of 25 min.[10] More broadly, the overall time to access care and ED length of stay data are in keeping with previous evidence demonstrating the benefits of APP care in the ED.[3]

The musculoskeletal scope of APPs in the ED results in earlier allocation, with APPs care focused solely on this cohort. The previously noted limitation in APP prescribing scope, however, constrains the capacity of APPs to influence allocation to analgesia timeframes. A reliance on non-APP staff to complete prescribing and administration-related tasks increases medical officer, nurse practitioner and nursing clinical loads and subsequently may delay components of their clinical activity. While the presence of APPs in the ED might improve access for patients under their care, the limited scope of APPs might impede attempts to improve access to analgesia and discharge for those under medical officer or nurse practitioner care. This potential finding is contrary to the core principles of APP models of care: to improve access to care and reduce unnecessary clinical load on medical officer/nurse practitioners.[13]

Further improvements in access to medication for patients with musculoskeletal conditions in Tasmanian EDs are possible and necessary, with barely one in three patients receiving analgesia within the 30 min timeframes defined as an indicator

of quality care.[2] Although the earlier allocation to health professional indicates that APPs are well positioned early in the clinical journey of musculoskeletal ED presentations, APP prescribing scope of practice changes need to be considered to fully capitalise on APPs' position in this journey. Changes to legislation and regulation in Queensland have demonstrated that the implementation of prescribing rights in the ED for APPs can be safe and efficacious.[14,15] Incremental changes may also be possible. With 90% of the medications (paracetamol and ibuprofen) prescribed and administered in this ED cohort available over the counter in Tasmania, local pathways that facilitate prescribing rights for APPs to this limited formulary may be a targeted first step towards the goal of improved access to analgesia in ED musculoskeletal presentations.

This is the first study to demonstrate the benefits of APP care on access to analgesia, as well as to delineate a target that may be sensitive to the impact of APP prescribing/analgesia administration. The breadth of these outcomes was achieved through a multi-site comparative study, utilising consecutive APP sampling and a comparison group matched against key factors with the potential to influence timeliness of analgesia in the ED. Furthermore, these groups reached the pre-planned sample size.

Limitations

While this study provides insight into the timeliness of analgesia for a musculoskeletal cohort presenting to Tasmanian EDs, it does not explore core aspects of the quality use of medicines: safety and efficacy.[2] From a methodological perspective, the development and implementation of a comparator group through case matching can lead to a range of biases.[16] The process of retrospective matching, by a sole author, has the potential to result in selection bias. Moreover, the factors chosen to base case matching upon may not include all factors associated with the primary outcome, with an example being the experience level of each clinician not being included in this analysis.[17] These important limitations can particularly be seen to impact the comparison group. There are limited numbers of Australian triage category 3 patients in the APP cohort who would potentially warrant and receive earlier and more significant analgesia.

Moreover, the final cohort of medical officer or nurse practitioner patients accounted for less than 50% of the total cohort who received analgesia. With so many patients not included, and several others being excluded due to incomplete records, a representative and complete comparison cohort is unlikely and thus the results of the comparison group are not a reflection of the entirety of medical officer or nurse practitioner musculoskeletal activity in the ED.

Despite the study collecting data from both Tasmanian EDs with APP models of care, the stated limitations suggest that the generalisability of these results is potentially limited. Although the implementation of APP clinicians will potentially have meaningful impacts on timely access to medication in the current resource-constrained ED environment, the absolute quantum of impact is likely to vary depending on individual EDs, APP scope of practice and models of care.

Conclusion

Patients presenting with musculoskeletal conditions to two Tasmanian EDs, who were assessed and managed by APPs, were given analgesia 18.5 min earlier (40.5 min vs 59 min, $P < 0.001$) than similar patients in the care of medical officer or nurse practitioner colleagues. Earlier allocation to APPs appears to be a significant factor in this result. Further improvements in access to analgesia for patients with musculoskeletal conditions may be achievable with the implementation of APP prescribing in Tasmania, with a concomitant reduction in medical and nursing staff clinical burden.

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