



Original Contribution

The impact of patient sex on paramedic pain management in the prehospital setting

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Abstract

Objective: The aim of this study was to establish the impact of patient sex on the provision of analgesia by paramedics for patients reporting pain in the prehospital setting.

Methods: This retrospective cohort study of paramedic patient care records included all adult patients with a Glasgow Coma Score higher than 12 transported to hospital by ambulance in a major metropolitan area over a 7-day period in 2005. Data collected included demographics, patient report of pain and its type and severity, provision of analgesia by paramedics, and type of analgesia provided. The outcomes of interest were sex differences in the provision of analgesia. Data analysis was by descriptive statistics, χ^2 test, and logistic regression.

Results: Of the 3357 patients transported in the study period, 1766 (53%) reported pain; this forms the study sample. Fifty-two percent were female, median age was 61 years, and median initial pain score (on a 0–10 verbal numeric rating scale) was 6. Forty-five percent of patients reporting pain did not receive analgesia (791/1766) (95% confidence interval [CI], 43%–47%), with no significant difference between sexes ($P = .93$). There were, however, significant sex differences in the type of analgesia administered, with males more likely to receive morphine (17%; 95% CI, 15%–20%) than females (13%; 95% CI, 11%–15%) ($P = .01$). The difference remains significant when controlled for type of pain, age, and pain severity (odds ratio, 0.61, 95% CI, 0.44–0.84).

Conclusion: Sex is not associated with the rate of paramedic-initiated analgesia, but is associated with differences in the type of analgesia administered.

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1. Introduction

The importance of pain management in the prehospital setting has been recognized by the Emergency Medical Services (EMS) Outcomes Project in the United States, with

the assertion that “the relief of discomfort might be the most important task EMS providers perform for the majority of their patients” [1]. Supporting this, the National Association of Emergency Services Physicians position statement states that “the relief of pain and suffering of patients must be a priority for every EMS system” [2].

The Council of Ambulance Authorities—the peak body representing statutory and other providers of ambulance

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services of Australia and New Zealand—has identified quality of pain relief as a surrogate measure of compassion and caring, and has recommended the development and adoption of clinical performance indicators that include reduction in pain. In the State of Victoria, the Metropolitan Ambulance Service has taken up this challenge and has set pain reduction benchmarks for paramedic management of cardiac and traumatic pain [3].

Although the importance of timely and effective pre-hospital analgesia has been acknowledged, factors that may influence paramedic administration of analgesia need to be identified to ensure that all patients have access to high-quality, equitable care. Although ED-based studies have suggested that sex might influence the provision of analgesia [4], there is ongoing debate about the existence of sex differences in analgesia, in part due to the limited number of studies and significant variations in study methodology and findings. The one study conducted in the prehospital setting suggests a sex bias, but has a number of flaws that limit its generalizability [5]. This study sought to determine the impact of patient sex on the provision of analgesia by paramedics for patients reporting pain in the prehospital setting in Australia.

2. Materials and methods

2.1. Study design and setting

This project is a substudy of a larger study investigating the prevalence and treatment of pain by paramedics in Australia. The study involved a retrospective analysis of anonymous patient care records (PCRs) for all adult patients (age, >14 years) with a Glasgow Coma Score higher than 12 transported to hospital by emergency ambulance for the 7-day period 16–22 August 2005. For cases involving documented reports of pain, demographics, provision of analgesia by paramedics, and type of analgesia provided, as well as the cause, duration, and region of pain and initial pain severity scores recorded by the treating paramedic were extracted by explicit review methodology [6]. The study was approved by the Monash University Standing Committee on Ethics in Research Involving Humans and by the Metropolitan Ambulance Service Research Committee.

The study setting was an ambulance service in Melbourne, Australia, where one organization provides emergency ambulance response to a population of approximately 3.9 million people. In 2005, when these data were collected, the service responded to approximately 253 000 emergency calls and transported 202 143 patients [3]. All paramedics in this jurisdiction may administer inhaled methoxyflurane or intravenous morphine sulfate according to protocols. Nonurgent cases or routine patient transfers may be referred to nonemergency transport agencies if the patient meets low acuity criteria [7], and these cases were not included in this study.

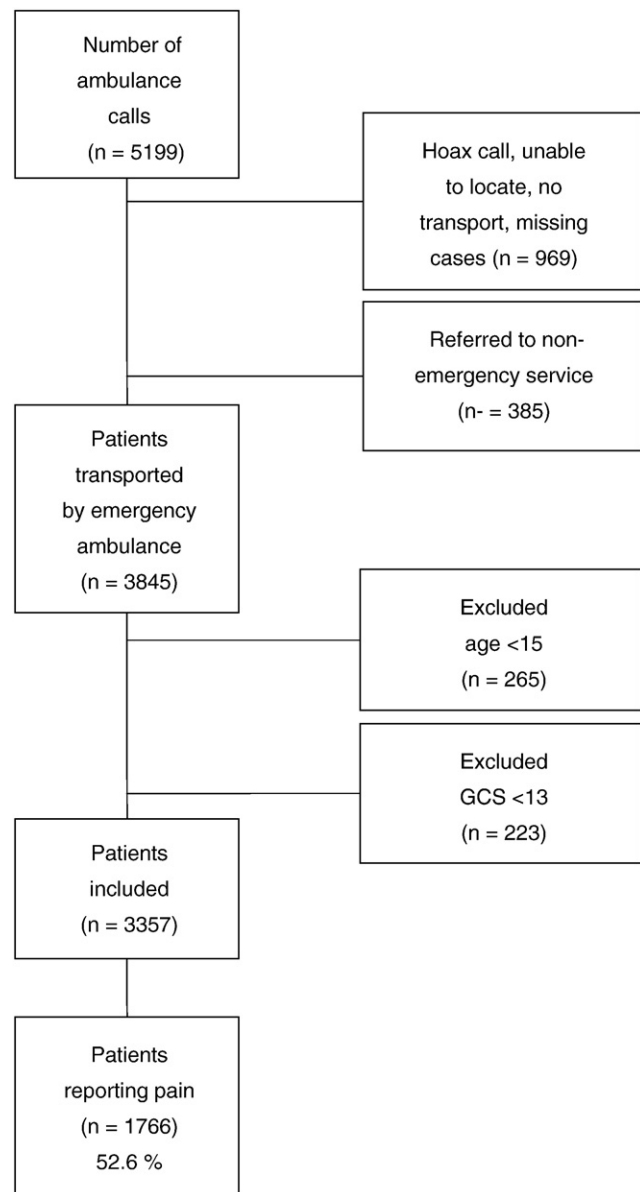


Fig. 1 Flow chart showing cases and excluded data.

2.2. Participants and data collected

Cases were included in this study if a description of pain was entered by the treating paramedic in the history section of the PCR, or where words associated with pain such as ache, headache, burning, or tearing sensations were noted. Pain was also identified by any notation of pain severity score in the vital sign section of the PCR. The most common pain severity assessment tool used by paramedics in this study was the verbal numeric rating scale (NRS), which requires the patients to rate their pain severity between 0 and 10, with 0 meaning no pain and 10 the worst pain imaginable. This tool has been validated in the ED for the assessment of acute pain [8,9] and is recommended for use in the prehospital setting [1].

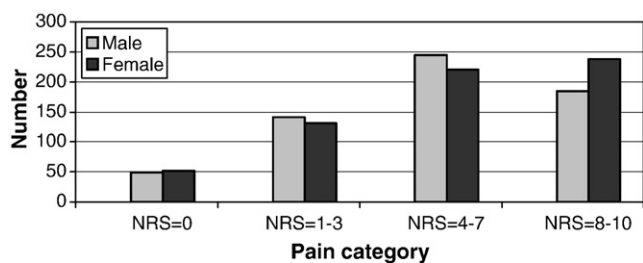


Fig. 2 Initial pain category distribution by sex.

2.3. Outcomes of interest

The primary outcome of interest was any differences in the provision of analgesia based on patient sex. Secondary outcomes were comparison of analgesic type administered by sex, refusal of analgesia by sex, and clinically significant reduction in NRS pain score. The latter was defined as a reduction in NRS pain score of 2 or more.

2.4. Data analysis

Data were analyzed using descriptive statistics and χ^2 test for the difference in the proportion of analgesia provided between males and females. Univariate and multivariate logistic regression methods were conducted to calculate odds ratios and their associated 95% confidence intervals (CIs). The explanatory variables used in the multivariate analysis include age, sex, pain severity, and initial pain score. The goodness-of-fit of the model was evaluated by the R^2 statistic, in which $R^2 = 0.13$ and the associated P value = .99. This suggests that the logistic model fitted the data very well. All statistical tests were 2 sided and considered to be significant at the .05 level. Stata version 9 (Stata Corporation, College Station, Tex) was used to undertake the statistical analysis.

3. Results

Of the 3357 patients transported by paramedics, 1766 (53%) reported pain (Fig. 1). The median age of transported

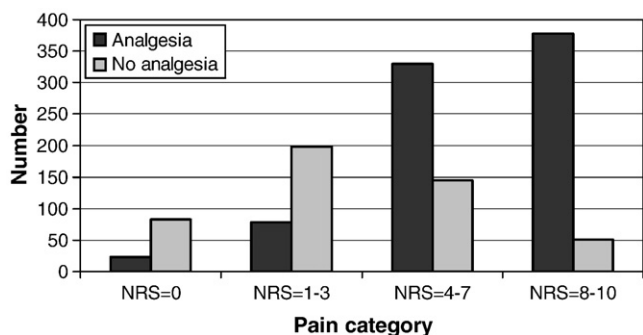


Fig. 3 Proportion of patients receiving analgesia by initial pain category.

patients was 61 years (interquartile range, 39-79) and 52% were female. Paramedics recorded an assessment of pain severity in 95% of cases ($n = 1672$), with an NRS most frequently used to record pain severity (71% of cases, $n = 1262$). More females than males reported severe pain (pain score, 8-10) at the first pain assessment ($P = .05$) (Fig. 2).

The proportion of patients reporting pain that did not receive analgesia was 45% (791/1766) (95% CI, 43%-47%). Analgesic administration for each NRS category is shown in Fig. 3.

Of the 1766 patients reporting pain, 15% ($n = 263$; 95% CI, 13%-17%) received morphine, 34% ($n = 605$; 95% CI, 32%-37%) received methoxyflurane, and 6% ($n = 104$; 95% CI, 5%-7%) received both. In cases where an NRS was recorded, 25% ($n = 109$) of patients with severe pain (NRS, 8-10) received morphine, with the rate falling to 20% ($n = 95$) for patients having moderate pain (NRS, 4-7).

Analysis of administration of analgesia, either methoxyflurane and/or morphine, showed no significant sex difference ($P = .93$). There were, however, significant sex differences in the type of analgesia administered, with females less likely to receive morphine (13% vs 17%; $P = .01$). This difference remains significant when controlled for type of pain, age, and pain severity (odds ratio for females receiving morphine, 0.61; 95% CI, 0.44-0.84) (Table 1).

There was a strong relationship between pain score category and receiving analgesia ($P \leq .001$) (Fig. 3). There was no sex difference in the proportion of patients reporting reduction in NRS pain score by 2 or more (46% vs 46%; $P = .82$).

Paramedics recorded that 11% (95% CI, 9%-13%) of patients declined analgesia when it was offered. There was no significant sex difference in the proportion of refusal (female, 10.9%; male, 10.7%; $P = .92$).

Table 1 Logistic regression of factors influencing the administration of morphine

| Variable | Odds ratio | 95% CI | P value |
|------------------------|------------|------------|---------|
| Age category (y) | | | |
| 15-40 | 1.0 | | |
| >40 and ≤ 60 | 1.42 | 0.92-2.20 | .114 |
| >60 and ≤ 80 | 1.34 | 0.86-2.07 | .193 |
| >80 | 1.33 | 0.80-2.20 | .266 |
| Sex | | | |
| Male | 1.0 | | |
| Female | 0.61 | 0.44-0.84 | .002 |
| Pain cause | | | |
| Cardiac | 1.0 | | |
| Trauma | 0.51 | 0.32-0.82 | .005 |
| Initial NRS pain score | | | |
| 0 | 1.0 | | |
| 1-3 | 2.24 | 0.49-10.30 | .301 |
| 4-7 | 11.96 | 2.86-49.95 | .001 |
| 8-10 | 20.65 | 4.93-86.53 | <.001 |

4. Discussion

Inadequate analgesia has been well documented in the ED setting [10,11]. Studies that have attempted to identify barriers to adequate analgesia in EDs have found that ethnicity [12], health insurance status [13], and extremes of age [14-16] were associated with risk of inadequate analgesia. However, these results have not always been reproduced in other studies, and as such the debate on the influence of these variables continues.

Although evidence of inadequate analgesia also exists in the prehospital setting [17-19], only a small number of studies have attempted to identify barriers to effective prehospital analgesia. One study identified paramedic concerns regarding the truthfulness of the patients' report of pain severity as a factor that influenced pain management practice [20]. As behavioral cues may be used to validate patient self-reports of pain severity, observational measures of pain require the observer to be cognizant of the effect that cultural, social, contextual, and interpersonal influences have on the expression of pain to minimize observer bias that may adversely affect treatment decisions [21]. Underestimation of pain has been found to occur when paramedics attempt to rate the patient's pain severity [22], and this phenomena has also been described in other health settings [23].

Few studies have investigated the effect of sex on analgesic administration, and of those published, the results are inconsistent. We found no sex bias in administration of analgesia, but a significant sex difference in the administration of morphine despite women having significantly higher levels of severe pain at the point of first assessment by paramedics. The only other published prehospital study to date of sex difference in paramedic-initiated analgesia also found that females are less likely to receive morphine [5]. However, that study has several limitations that included exclusion of pain caused by conditions other than isolated extremity injury.

These results are similar to the findings of others in a variety of practice settings. A study of nurses' intention to administer prescribed analgesia using clinical vignettes found that female patients were less likely to be given analgesics than males in identical circumstances [24]. However, the author did not posit reasons for this difference. In a postoperative setting, females were found to have received less analgesics than males, although this result was compromised owing to the failure to report sex differences in pain severity [25]. Sex differences in pain management have been documented in an oncology setting, with females less likely than males to receive adequate analgesia [26]. In contrast, a study of analgesic practice in an ED setting found conflicting results, with females more likely to receive analgesia and receive stronger analgesics, for headache, neck, or back pain [4]. A recent multicenter study of pain management practice in the ED also found no sex differences [27].

The difference in morphine administration is an interesting finding. Possible explanations might include bias in

analgesic choice based on sex and female patients' reluctance to accept morphine analgesia. The design of this study does not enable reasons for the described sex differences to be identified. To do this, a further study of paramedic attitudes and beliefs is planned using focus groups and interviews to elicit attitudes and beliefs regarding pain assessment and pain management. This may also reveal reasons for the low overall rates of analgesia for patients in moderate to severe pain.

Studies of sex differences regarding pain expectations have demonstrated that both sexes expect women to be more likely to report pain, to be more sensitive to pain, and less tolerant of pain than men [28,29]. If this finding applies to this research setting, these beliefs may influence the paramedic's decision to administer or withhold morphine, which is seen as an analgesic reserved for severe pain. There is also evidence that treating physician's sex influences pain management decisions [30], and that in an experimental pain setting the sex of the experimenter influenced pain reporting [31]. Although the sex of the paramedic may have had some influence on decisions to administer morphine, this could not be tested in this study as information about the treating paramedic was deidentified.

4.1. Limitations

This study has some limitations that must be considered when interpreting the results. It is a retrospective study which used a convenience sample of adult patients transported by ambulance paramedics over a 7-day period. The well-known problems with documentation associated with this method may have occurred, including the possibility of documentation errors or bias in recording patient observations and drug therapy. Sex differences in propensity to refuse analgesia may also have influenced the results. However, we consider this unlikely as refusal rates were similar between sexes. It is possible that transport time or ability to establish intravenous access influenced analgesia delivery. The study was conducted at a single ambulance service and may not be generalizable to other settings.

5. Conclusion

Sex is not associated with the rate of paramedic-initiated analgesia, but is associated with differences in the type of analgesia administered. A significant proportion of patients reporting pain decline analgesia when it is offered.

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