

THE EPIDEMIOLOGY OF PAIN IN THE PREHOSPITAL SETTING

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ABSTRACT

Objective. To develop national estimates of the epidemiology of pain in the prehospital setting. **Methods.** Cross-sectional data on a probability sample of 21,103 emergency department (ED) visits from the 1999 National Hospital Ambulatory Medical Care Survey were analyzed. For patients arriving by ambulance, the frequencies (95% confidence intervals) of patients presenting with no level of pain reported (data unknown or missing) and those reporting no, mild, and moderate or severe pain were determined. The reasons for visit among those with moderate or severe pain, and the ED narcotic analgesic use among those with pain information reported and not reported, were also determined. **Results.** Of the 102.8 million patients visiting the ED in 1999, 14.5 million arrived by ambulance. Fifty-three percent (49–58%) were female. Seven million six hundred thousand [52% (48–56%)] had no information on presenting level of pain reported, 2.0 million [14% (2–25%)] had no pain, 2.0 million [14% (3–25%)] had mild pain, and 2.9 million [20% (12–29%)] had moderate or severe pain. Among those with moderate or severe pain, the most common reasons for visit were injuries 27% (11–43%) and non-injury musculoskeletal symptoms 18% (0–39%). Narcotic analgesics were ordered or continued in 13% (0–29%) of those with no presenting level of pain recorded and 21% (9–34%) of those for whom the presenting level of pain was recorded. **Conclusion.** Pain is a common condition among prehospital patients: 20% reported moderate to severe pain. Given the use of narcotic analgesics among those for whom pain information was not reported, this is likely a conservative estimate. **Key words:** pain; prehospital; epidemiology.

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Pain is one of the primary complaints of people seeking medical care, and the adverse effects of acute pain

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are associated with significant morbidity and mortality.^{1–8} Despite the importance of the problem, medical care providers have not adequately addressed pain control.^{9–11} In the field of emergency medicine, inadequate pain control has been recognized as an important issue, both in the emergency department (ED) and in the prehospital setting.^{12–17}

The Emergency Medical Services Outcomes Project, funded by the National Highway Traffic Safety Administration, used frequency data and expert opinion to rank-order emergency medical services (EMS) conditions for children and adults based on their potential value for the study of effectiveness of EMS care. EMS professionals identified relief of discomfort as the most relevant outcome measure for the majority of prehospital conditions, and also as the prehospital intervention having the most potential impact for the majority of common EMS conditions.¹⁸ These findings are consistent with the opinion of one noted EMS investigator, who has suggested that relieving discomfort may be the most important task EMS providers perform for the majority of their patients.¹⁹

Despite the belief that discomfort is common, the epidemiology of pain among prehospital patients is unknown.^{17,20} A few small international studies have been performed; no studies have been conducted in the United States. We sought to develop national estimates of the prevalence of pain among prehospital patients using the 1999–2000 National Hospital Ambulatory Medical Care Survey (NHAMCS).

METHODS

This study was an analysis of data on ED visits from the 1999 NHAMCS. Sponsored by the National Center for Health Statistics (NCHS), the NHAMCS collects data each year for a national probability sample of ED visits and outpatient visits, to provide information about ambulatory medical care in the United States.²¹ Data for this study were drawn from a NCHS public use database, with all patient identifiers removed, and the study was approved for exemption from review by the site institution's human studies committee.

The ED visit database of the 1999 NHAMCS is a

nationally representative sample of all visits to non-federal, short-stay hospitals, excluding hospitals with an average length of stay for all patients of ≥ 30 days. Using a four-stage probability sample design, the 1999 NHAMCS selected a sample of 21,103 ED visits from 112 primary sampling units and 489 hospitals, with a hospital response rate of 93%.²¹ The Bureau of the Census regional office staff organized data collection, including training the field collection staff and monitoring hospital data collection activities. Field representatives were responsible for enrolling hospitals and training the hospital staff on the visit sampling method and completion of data forms. Trained hospital staff at each of the selected hospitals completed the data forms on a systematic sample of patients seen during a randomly assigned four-week period.

Data forms were completed at or near the time of the ED visit for each sampled patient. The form collected data regarding the mode of patient arrival and presenting level of pain (none, mild, moderate, severe, or unknown). The form also collected information on up to six medications that were ordered, supplied, administered, or continued during the patient's visit. Patients' complaints or reasons for seeking care were classified according to *A Reason for Visit Classification for Ambulatory Care*.²² The reason for visit is the primary complaint(s), symptom(s), or reason(s) that led a patient to come to the ED. The reason for visit classification system, developed by the NCHS, organizes reasons for visit into related groups.

Based on the probabilities of selection and adjustment for nonresponse, a "patient visit weight" was assigned by the NCHS for each of the 21,103 ED visits included in the 1999 NHAMCS sample. The probability sampling design of the NHAMCS allows national estimates to be calculated from sample data using these patient visit weights. Standard errors for these national estimates were computed using the method recommended by the NCHS.²¹ Ninety-five percent confidence intervals (95% CIs) were calculated using the standard errors. Data analyses were performed using SAS software version 8.3 (SAS Institute Inc., Cary, NC).

RESULTS

There were an estimated 102.8 million ED visits in 1999. Fourteen million five hundred thousand, or 14% (95% CI 10–18%) arrived by ambulance. Demographic data and pain information for those arriving by ambulance are shown in Table 1. Ninety percent of those arriving to the ED by ambulance were 18 years of age or older. Despite the fact that pain information was not collected (unknown or missing) for more than half of the patients arriving by ambulance, 20% of those arriving by ambulance reported moderate or severe pain. Among those with pain information collected,

TABLE 1. Demographic Information and Presenting Level of Pain among Patients Arriving to the Emergency Department by Ambulance in 1999

	Number in Thousands	Percentage (95% Confidence Interval)
Sex		
Male	6,777	47 (42–51)
Female	7,762	53 (49–58)
Age		
<18 years	1,489	10 (0–23)
18 years or older	13,050	90 (88–91)
Presenting level of pain		
Unknown	7,566	52 (48–56)
Moderate or severe	2,967	20 (12–29)
Mild	2,017	14 (3–25)
None	1,990	14 (2–25)

TABLE 2. Narcotic Analgesic Use among Patients Brought by Ambulance to the Emergency Department (ED)

Narcotic Use*	Percentage (95% Confidence Interval)
All ambulance patients	17 (7–27)
Those with pain information reported	21 (9–34)
Those with pain information not reported	13 (0–29)

*Narcotics ordered, supplied, administered, or continued during the patient's ED visit.

29% reported mild pain and 42% reported moderate or severe pain. ED narcotic analgesic use among patients arriving by ambulance is shown in Table 2. The prevalence of narcotic analgesic use among those with no pain information recorded (13%) approached the prevalence of narcotic use in all patients (17%), suggesting that many patients with no pain information recorded had substantial pain. The most common reasons for visit classifications among those with moderate to severe pain are shown in Table 3.

DISCUSSION

Our results indicate that substantial pain is common among prehospital patients. Twenty percent of the patients arriving by ambulance to the ED in 1999 reported moderate to severe pain. Given the use of narcotic analgesics among those for whom pain information was not reported, this is likely a conservative

TABLE 3. Most Common Reason for Visit among Patients Presenting by Ambulance with Moderate or Severe Pain

Reason for Visit Classification	Percentage (95% Confidence Interval)
Injury	27 (11–43)
Non-injury musculoskeletal symptoms	18 (0–39)
Chest pain and related symptoms	18 (0–39)
Digestive symptoms, including abdominal pain	11 (0–39)
Respiratory symptoms	7 (0–42)

estimate. Among those with moderate to severe pain, injuries and non-injury-related musculoskeletal symptoms accounted for nearly half of patient visits. Among those patients with pain information collected, 42% reported moderate to severe pain. These results confirm the belief of many prehospital experts that pain is an important problem for prehospital patients.

To our knowledge, this is the first study examining the epidemiology of pain in the prehospital setting among U.S. patients. Chambers and Guly performed a retrospective analysis of 502 consecutive patients arriving to the ED by ambulance in New Zealand.²³ Three hundred forty (68%) were trauma patients; 162 (32%) were non-trauma patients. Medical records indicated that 54% of all patients (49% of trauma patients and 6% of non-trauma patients) had pain as a symptom on arrival. The authors concluded that the treatment of pain in the prehospital setting could improve prehospital quality of care.

Ricard-Hibon et al. evaluated the pain status of prehospital patients in France.²⁰ The EMS system in France is based on two tiers of ambulances: those staffed by emergency medical technicians (EMTs) for basic life support and physician-staffed ambulances for advanced life support. Three hundred ninety-seven patients were prospectively evaluated by physician-staffed ambulances. One hundred forty-two patients (35%) were not able to be assessed for pain, due to cardiorespiratory arrest (43%), confusion (37%), or language difficulties, psychiatric problems, and other causes (20%). Of the 255 patients (65%) able to be assessed for pain, 50% were cardiac patients and 14% were trauma patients. One hundred eight (42%) complained of pain.

In a follow-up study, Richard-Hibon et al. prospectively evaluated pain in two groups of patients evaluated as part of a quality control program.¹⁷ In group one, 400 patients were prospectively evaluated by physician-staffed ambulances. One hundred forty-five patients (36%) could not be assessed for pain; the most common reasons were major cardiovascular disease (44%), unconsciousness (40%), difficulties in language or understanding (8%), and psychiatric disease (5%). Two hundred fifty-five (64%) were able to be evaluated for pain; 108 patients (42%) reported pain. In group two, 392 patients were evaluated; 247 patients (63%) were able to be assessed for pain, and 105 patients (43%) reported pain. Information regarding those in whom pain could not be assessed was not provided. In both groups, the type of complaint or problem among those able to be assessed was not provided.

In sum, these international studies report a prevalence of pain in the prehospital setting of 40–50% of those assessed. However, these studies have limited generalizability to prehospital patients in the United States. Chambers and Guly relied on retrospective

data collected from the medical record, and Richard-Hibon et al. collected data on only a subset of high-acuity patients seen by physician-staffed ambulances. Both studies were conducted in countries with markedly different systems of prehospital care.

LIMITATIONS AND FUTURE STUDIES

Our study had a number of limitations. First, pain information was missing for more than 50% of patients. These patients were considered to have not had pain, despite the fact that many received narcotic analgesics in the ED. The reason that so many patients arrived without pain information reported is unknown. Much of this is likely due to lack of assessment by ED staff. Pain assessment at the time of patient presentation was not mandated by the Joint Commission on Accreditation of Healthcare Organizations until January 1, 2001,²⁴ and most EDs did not routinely collect pain information on patients before that time. Despite that fact that pain information was missing for so many patients, our study results demonstrate that at least one in five patients arrives to the ED in moderate or severe pain. Another limitation of the NHAMCS data set is that pain information was collected at the time of ED presentation. Patients may have received EMS interventions, such as analgesics, splinting, or nitroglycerin, that effectively relieved pain by the time of ED presentation. This limitation could result in an underestimate of the prevalence of pain among prehospital patients. Finally, while the NHAMCS data allow the development of national estimates, pain information was not uniformly collected in a prospective manner. Some of the pain information was collected from the chart retrospectively, increasing the chance for study error or bias.

Future studies need to prospectively evaluate the prevalence of pain among prehospital patients in the United States. Such studies could definitively confirm or refute the hypothesis that pain is a common condition among prehospital patients. Further research is also needed to determine optimal analgesic treatment protocols for painful conditions and to determine the effect of this treatment on a range of patient outcomes. Out-of-hospital cardiac arrest research has demonstrated improved patient outcome from EMS intervention. Cardiac arrest is a rare condition representing only a small portion of the EMS population. Prehospital pain outcomes research provides an opportunity to demonstrate to the medical community, and to federal policy-makers, that EMS interventions relieve suffering and improve patient outcomes for very common conditions as well.

CONCLUSION

It is remarkable that, despite numerous articles identifying pain as an important issue in prehospital care,

the prevalence of pain in the prehospital setting remains unknown. Our results indicate a nationwide prevalence of moderate to severe pain in the prehospital setting of 20%. Given the use of narcotic analgesics among those for whom pain information was not reported, this is likely a conservative estimate.

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