MAYO CLINIC

Epidemiology of Emergency Department Visits for Opioid Overdose: A Population-Based Study

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Abstract

Objectives: To evaluate the rate of emergency department (ED) visits for opioid overdose and to examine whether frequent ED visits for opioid overdose are associated with more hospitalizations, near-fatal events, and health care spending.

Patients and Methods: Retrospective cohort study of adults with at least 1 ED visit for opioid overdose between January 1, 2010, and December 31, 2011, derived from population-based data of State Emergency Department Databases and State Inpatient Databases for 2 large and diverse states: California and Florida. Main outcome measures were hospitalizations for opioid overdose, near-fatal events (overdose involving mechanical ventilation), and hospital charges during the year after the first ED visit.

Results: The analytic cohort comprised 19,831 unique patients with 21,609 ED visits for opioid overdose. During a 1-year period, 7% (95% CI, 7%-7%; n=1389 patients) of the patients had frequent (2 or more) ED visits, accounting for 15% (95% CI, 14%-15%; n=3167) of all opioid overdose ED visits. Middle age, male sex, public insurance, lower household income, and comorbidities (such as chronic pulmonary disease and neurological diseases) were associated with frequent ED visits (all $P<.01$). Overall, 53% (95% CI, 52%-54%; n=11,412) of the ED visits for opioid overdose resulted in hospitalizations; patients with frequent ED visits for opioid overdose had a higher likelihood of hospitalization (adjusted odds ratio, 3.98; 95% CI, 3.38-4.69). In addition, 10.0% (95% CI, 10%-10%; n=2161) of the ED visits led to near-fatal events; patients with frequent ED visits had a higher likelihood of a near-fatal event (adjusted odds ratio, 2.27; 95% CI, 1.96-2.66). Total charges in Florida were $208 million (95% CI, $200-$219 million).

Conclusion: In this population-based cohort, we found that frequent ED visits for opioid overdose were associated with a higher likelihood of future hospitalizations and near-fatal events.

 ■ Mayo Clin Proc. 2014;89(4):462-471

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Pain management has received increasing attention over the past decade, including the US Joint Commission's focus on patient analgesia.[1] Between 1999 and 2010, the sales of opioid analgesic drugs to hospitals, pharmacies, and practitioners quadrupled; in 2010, enough opioid analgesic drugs were sold to medicate every adult in the United States, with the equivalent of 5 mg of hydrocodone every 4 hours for 1 month.[2] An unintended potential consequence of these changes is an increase in the overdose of prescribed opioid analgesic drugs.[3] Indeed, emergency department (ED) visits for opioid overdoses increased by 183% from 2004 to 2011.[4] In parallel, there has been an increase in overdose hospitalizations involving opioid analgesic drugs, with a rise from 43,210 in 1999 to 71,350 in 2006,[5] with a total direct medical cost of $1.3 billion.[6]

In this context, the US government identified the reduction of fatal and nonfatal poisonings as one of the objectives of *Healthy People 2020* through better prevention, surveillance, and treatment.[7] To develop and implement preventive strategies effectively, identifying the patients at risk for future overdose-related outcomes is critical. Although the current literature reports risk factors associated with ED visits for opioid overdose and deaths due to opioid overdose,[8-11] these studies were conducted within limited populations, thereby potentially limiting the generalizability of their inferences. Furthermore, the dilemma of treating pain appropriately while avoiding adverse events is complicated by insufficient data on determinants of important patient morbidity, that is, hospitalizations and near-fatal events.

Mayo Clin Proc. ■ April 2014;89(4):462-471 ■ http://dx.doi.org/10.1016/j.mayocp.2013.12.008
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To address these gaps in current knowledge, we analyzed data from large population-based multipayer databases from 2 large and diverse states: California and Florida. The 2 objectives of this study were: (1) to quantify the rate of ED visits for opioid overdose, with a focus on frequent ED users, hospitalizations, near-fatal events, in-hospital mortality, and charges for ED and inpatient service in adults, and (2) to examine whether frequent ED visits for opioid overdose are associated with more hospitalizations, near-fatal events, and in-hospital mortality.

METHODS

Study Design and Settings

We conducted a retrospective population-based cohort study by using ED encounter data abstracted from the Healthcare Cost and Utilization Project (HCUP) State Emergency Department Databases (SEDD) and State Inpatient Databases (SID). The HUCP-SEDD includes all treat-and-release and transfer ED visits from short-term, acute care, nonfederal, community hospitals in participating states. The HCUP-SID includes all inpatient discharges from short-term, acute care, nonfederal, general, and other specialty hospitals in participating states, including those discharges admitted from the ED. Taken together, we identified all ED visits regardless of disposition and with information on short-term outcomes for patients admitted through the ED. Additional details of the SEDD and SID can be found elsewhere.[12,13]

Data were used from the SEDD and SID from California and Florida in 2010 and 2011. These 2 states were selected for their large populations, geographical distribution, data quality, and mainly because these databases contain unique encrypted patient-level identifiers that enable follow-up of specific patients over time. The institutional review board of Massachusetts General Hospital waived review of this study.

By using these data sets, we counted frequency of ED visits for opioid overdose in a given year for each patient. To measure frequency of ED visit for each patient, the patient's first ED visit was captured during the 2010 calendar year, referred to as the index ED visit. For each patient, the number of subsequent ED visits for opioid overdose was then counted for the following 365 days. This count was added to the index visit to create for each patient a measure of total ED visit frequency.

Study Population

We identified all adults (18 years or older) with at least 1 ED visit for any opioid overdose in 2010 by using the *International Classification of Diseases, Ninth Revision, Clinical Modification* code for poisoning by opiate drugs and related narcotic drugs (code 965.0x) in the primary or secondary diagnosis fields (see the Supplemental Appendix available online at http://www.mayoclinicproceedings.org). We excluded out-of-state residents.

Covariates

The databases contain information on patient characteristics, including demographic characteristics (age, sex, and race and ethnicity), primary insurance type, household income, rural-urban status, and patient comorbidities. The SEDD also include ED disposition. The patient characteristics at the first visit were used for primary analysis. Primary insurances were categorized into Medicaid, Medicare, private sources, self-pay, and other types. Average income quartiles for the patient residence were examined. The rural-urban status of the patient residence was defined according to the National Center for Health Statistics.[14] Comorbidities were drawn by using Elixhauser comorbidity measures, a comprehensive set of comorbidity measures for use with large administrative data sets.[15] This risk-adjustment tool has been validated extensively.[16]

Study End Points

Outcomes of interest were opioid overdose hospitalizations, near-fatal events, in-hospital mortality, and charges for both ED and inpatient services. *Hospitalization* was defined as a hospital admission for opioid overdose during the year after the index visit. *Near-fatal event* was defined as an opioid overdose involving noninvasive or invasive mechanical ventilation[17]; the use of mechanical ventilation was identified with the HCUP Clinical Classifications Software code 216. *In-hospital mortality* was defined as any-cause mortality at opioid overdose ED visits and hospitalizations during the year after the index visit. Charges reflect the total facility fees aggregated for a given individual; they are available only in the Florida