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Brief Report

RESULTS OF A NALOXONE SCREENING QUALITY-IMPROVEMENT PROJECT IN AN ACADEMIC EMERGENCY DEPARTMENT

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□ **Abstract—Background: The Emergency Department (ED) is a medical setting increasingly utilized by opioid users. In January 2016, our health system initiated a take-home naloxone education and distribution program. From July to August 2016, screening was performed in the ED to identify patients for take-home naloxone. Objective: To evaluate the outcomes of routine screening for take-home naloxone in the ED setting and to determine key screening questions. Secondary analysis of Electronic Health Records for discrete elements that could help identify individuals for naloxone. Methods: This is a single-center, retrospective cohort study conducted at two EDs within an academic health system. A screening tool was verbally administered to a convenience sample of ED patients as part of a pilot project to identify patients for overdose education and naloxone. Patient charts were reviewed retrospectively for pre-determined historical elements, medications prescribed, and substance use history. Descriptive and comparative analysis using Fisher two-tailed tests were performed with regard to historical elements, naloxone recommendation and prescription. Results: A total of 182 patients were included. Following screening, 58 (31.9%) were identified as candidates for take-home naloxone. Of those, 36 (62.1%) accepted naloxone recommendation and 19 (32.8%) were prescribed naloxone. Individuals not prescribed naloxone despite recommendation either declined naloxone 22 (37.9%) or were not prescribed naloxone 17 (29.3%). Subanalysis of questions with binary yes/no answers (N = 171) demonstrated significant prediction of both naloxone recommendation (ROC = 0.944) and prescription (ROC = 0.897). Conclusions: Routine screening for take-home naloxone can help identify patients at-risk for opioid overdose and increase naloxone access in the ED.**

□ **Keywords—take-home naloxone; opioid overdose; opioids; harm reduction**

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INTRODUCTION

Opioid overdose from prescription opiates, heroin, and synthetic opiates is a growing cause of accidental death in the United States. The overwhelming loss experienced by communities due to opioid overdose has resulted in a push for practices and policies that support naloxone distribution. Naloxone is an opioid antagonist that can reverse an opioid overdose (1). For over 20 years, community groups have put naloxone in the hands of opiate users and their peers (2). These Overdose Education and Naloxone Distribution (OEND) programs have decreased overdose deaths in their respective communities (3–5). Other strategies to further support naloxone distribution involve third-party prescribing, Good Samaritan laws to

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protect prescribers and laypersons, and pharmacist prescribing (6,7). There is need to increase access to naloxone in health care settings.

Complications from increased opioid use nationally has reflected in emergency department (ED) visits. From 1993 to 2010, the ED visit rate for opioid overdose quadrupled (8). In 2014 alone, 348,000 ED visits were attributable to prescription opiates (9). Because the ED sees many patients with overdose risk, this setting serves an important role to prevent opioid-related overdose deaths (10).

Various EDs have responded by developing take-home naloxone programs (11). Programs have shown that OEND can effectively be performed in the ED setting, and can spread awareness to the at-risk population about naloxone availability with high acceptance (11,12). In 2015, the American College of Emergency Physicians endorsed the critical role of early naloxone administration and published recommendations to prescribe naloxone to at-risk populations (13).

In January 2016, our health system implemented a system-wide OEND program. Naloxone-prescribing guidelines were collaboratively developed and made available. Physicians, pharmacists, and nurses were educated on naloxone. Electronic health records (EHR) were modified to include an electronic decision support tool to facilitate naloxone prescribing (14).

Although many programs have developed guidelines for prescribing naloxone, a reliable screening tool that identifies patients based on recommended guidelines is needed for routine screening in emergency medical settings. The purpose of this pilot study was to evaluate the feasibility and outcomes of routine opioid overdose risk screening in an ED setting. We aimed to determine 1) if routine screening increases identification of candidates for take-home naloxone, 2) if routine screening increases naloxone prescribing to those who need it, and 3) which screening tool questions were highest yield for identifying naloxone candidates. Secondary analysis to support this endpoint included: 1) whether the screening questions predicted naloxone prescription, 2) if any factors identified in the chart review predicted naloxone recommendation or prescription, and 3) if any responses to screening questions were not reflected in the chart review. Secondary analysis was performed to help inform EHR efforts that identify individuals for naloxone and recommend a naloxone prescription.

METHODS

Study Design

This was a single-center, retrospective pilot study evaluating routine screening for take-home naloxone in two EDs. Institutional Review Board approval was obtained from the University of California San Diego Human Research Protections Program. From July to August 2016, a medical student provided routine screening of patients in the ED for opioid overdose risk. EHR data were then retrospectively reviewed on each screened patient.

Take-Home Naloxone Screening Tool

The study investigators created the take-home naloxone screening tool based on the health system's Naloxone Prescribing Guidelines (Supplementary Figure 1) (10). A combination of closed-ended questions and a single open-ended question were used. The closed-ended questions were included to identify the most important and effective questions for take-home naloxone screening and to characterize the ED populations in need of naloxone. The open-ended question was included to capture the spectrum of how individuals think of the substances they use (Supplementary Figure 2).

Setting

Screening for take-home naloxone occurred in an urban and suburban ED, both within a single academic health system with 74,280 emergency visits annually. The urban ED is a 37-bed ED serving a largely medically underserved population and connected to a 390-bed hospital. The suburban site is a 32-bed ED co-located with specialty medical centers.

Implementation of Routine Screening

The take-home naloxone screening tool was administered verbally by one author (JD) from July to August 2016 as part of a pilot project and quality-assurance initiative. All answers were recorded in real time using the SurveyMonkey® (San Mateo, CA) online data collection tool on a portable tablet. Each participant was assigned a unique identifier that was recorded in the screening tool.

Convenience sampling of patients was performed in both EDs. Patients were included if they were patients in the ED, older than 18 years of age, and consented to screening. Patients were excluded from screening if they were triaged as high acuity, under 18 years of age, pregnant, incarcerated, or if they declined participation. A total of 196 patients were screened.

Patients were given verbal information about the naloxone quality-improvement initiative. After verbal consent was requested and received, the screening tool and Opioid Risk Tool (ORT) were delivered (15). If the patient answered yes to any of the primary screening questions (questions 1A, 2, 3, 6) in the screening tool, naloxone was recommended. Patients who were recommended naloxone were trained in how to 1) prevent opioid-related overdose, 2) recognize an opioid-related overdose,

and 3) use naloxone should respiratory depression occur. Patients identified as candidates for naloxone were asked why they accepted or declined naloxone and whether they plan to tell friends, family, or peers about having naloxone. The ED providers of patients who accepted naloxone were informed of the screening results and suggested to prescribe naloxone. It was then the ED providers' decision whether to prescribe naloxone to their patient.

Naloxone Prescription and Receipt

Patients prescribed naloxone could obtain their prescription from any pharmacy of their choosing. The institution's pharmacies had three forms of naloxone available: intramuscular with syringes, intranasal with atomizer, and autoinjector (intramuscular). For uninsured or underinsured patients, internal funds were available to cover the cost of the naloxone.

Chart Review

One author (JD) systematically reviewed the medical chart of each screened patient. Data retrieved from the chart included current medications and their indications, diagnoses, and naloxone prescription. Additionally, documented information related to patients' substance use and overdose history, and specific substances used was gathered. Primary criteria for a positive chart review were 1) documentation of opioid use, which included opioid prescriptions, opioid-related diagnoses, and current or historic recreational opioid use; or 2) history of opioid-related overdose. These criteria capture indications for naloxone prescription. A second author (KPE) utilized retrospective chart review to calculate Risk Index for Overdose or Serious Opioid-Induced Respiratory Depression (RIOSORD) (16). The purpose of the chart review was to assess whether patients had chart documentation of factors that reflected responses to screening questions.

Statistical Analysis

Individual questions on the Take-Home Naloxone screening tool and screening intervention outcomes were tested for significance against demographic parameters, medical diagnoses, and substance use history identified during chart review using Fisher's two-tailed tests. Statistical significance was set at $p < 0.05$. Multivariate logistic regression model was used to assess whether the screening questions predicted naloxone prescriptions.

RESULTS

Analysis was performed for 182 patients with complete datasets. Fifty-eight patients were identified as candidates to receive naloxone, 36 patients accepted the naloxone recommendation, and 19 patients received a naloxone prescription (Figure 1). Participant demographics are summarized in Table 1.

The screening tool as a whole did not predict whether an individual who was recommended naloxone would receive a naloxone prescription. However, a subanalysis of those patients whose screening questions indicated a clear binary yes/no answer (n = 171) demonstrated significant prediction of both naloxone recommendation (receiver operating characteristic = 0.944) and prescription (receiver operating characteristic = 0.897) (Figures 2 and 3). Several individual screening questions correlated significantly with naloxone prescription: "Do you take an opioid for pain or other conditions?," which showed a fivefold increased likelihood of receiving a naloxone prescription ($p = 0.002$, 95% confidence interval [CI] 1.8–13.3); "Do you take antidepressants?," which showed a fourfold increased likelihood of naloxone prescription ($p = 0.005$, 95% CI 1.5–10.3); "Do you know someone who takes opioids that you are concerned about?," which showed an 11-fold increased likelihood of naloxone prescription ($p = 0.008$, 95% CI 3.1–39.8).

Chart review identified 47 (25.8%) as candidates for take-home naloxone, primarily those with past opioid prescriptions (37, 20.3%) and active recreational opioid use (6, 3.3%). Many screening questions correlated with EHR documentation. Naloxone recommendation was associated with documentation of an active opioid prescription, chronic pain diagnosis, or a visit with pain medicine. Naloxone prescription was associated with documentation of homelessness, methamphetamine use, history of substance use, and concurrent antidepressant use. Screening questions identified 10 patients who experienced a historical opioid adverse event, but only one of these was documented in the EHR. There was no documentation commenting on family members or peers with concern for overdose.

ORT did not significantly correlate with naloxone recommendation or receipt. Low-risk patients by ORT were recommended naloxone at a rate of 25.74% (26/101), moderate-risk at 33.33% (12/36), and high-risk at 45.45% (20/44). Similarly, naloxone recommendation did not significantly correlate with patients' RIOSORD class (Supplementary Figure 3).

Most of those who accepted naloxone recommendation wanted it for themselves or others in case of an emergency, whereas those who declined naloxone prescription reported that they did not see themselves at risk for overdose. Less commonly, patients wanted more time to think about naloxone, already had naloxone, or were enrolled in substance use programs that would confiscate naloxone. Anecdotally, several patients expressed regret that they did not have naloxone earlier due to the loss of friends to overdose.

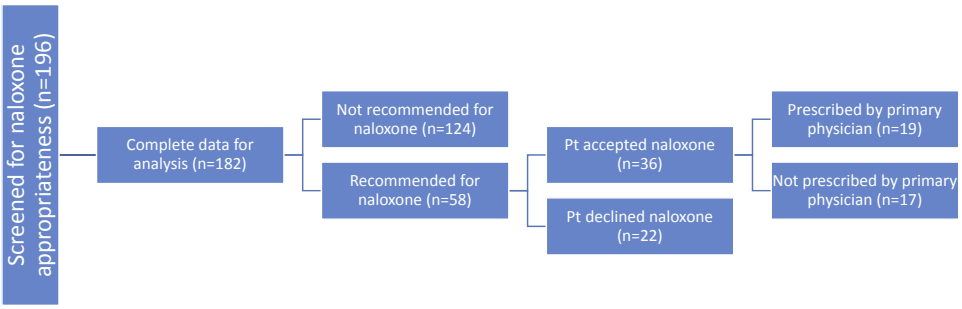

Figure 1. Flow diagram of outcomes for patients screened for naloxone appropriateness.

During the study period, 11 patients seen in the ED were prescribed naloxone and were not screened via the screening tool.

DISCUSSION

In this study, screening for take-home naloxone candidacy based on recommended guidelines led to identification of patients in need of naloxone, overdose prevention education, and prescriptions of take-home naloxone. Although the naloxone screening tool correlated with naloxone recommendation, the screening tool and recommendation for take-home naloxone did not correlate with naloxone receipt. However, when looking at only binary yes/no responses to screening questions, the screening tool significantly correlated to both

Table 1. Demographics and Naloxone Recommendation

	Total Screened Population (n = 182)	Recommended Naloxone (n = 58)	Not Recommended Naloxone (n = 124)
Age, average (median)	49 (51)	46.4 (47.5)	50.2 (52)
Location			
Urban, n (%)	78 (42.9)	18 (31.0)	64 (51.6)
Suburban, n (%)	104 (57.1)	40 (69.0)	60 (48.4)
Sex			
Female, n (%)	94 (51.6)	30 (51.7)	58 (46.8)
Male, n (%)	88 (48.4)	28 (48.3)	66 (53.2)
Race			
Asian, n (%)	7 (3.8)	0 (0)	7 (5.6)
Black, n (%)	34 (18.7)	9 (15.5)	25 (20.2)
White, n (%)	103 (56.6)	39 (67.2)	64 (51.6)
Other, n (%)	38 (20.9)	10 (17.2)	28 (22.6)
Ethnicity			
Caucasian, n (%)	2 (1.1)	2 (3.4)	0 (0)
Hispanic, n (%)	34 (18.7)	8 (13.8)	26 (21.0)
Non-Hispanic, n (%)	143 (78.6)	46 (79.3)	97 (78.2)
Other, n (%)	3 (1.6)	2 (3.4)	1 (0.8)
Insurance type			
Medicaid, n (%)	93 (51.1)	34 (58.6)	59 (47.6)
Medicare, n (%)	34 (18.7)	10 (17.2)	24 (19.4)
None, n (%)	6 (3.3)	3 (5.2)	3 (2.4)
Private, n (%)	48 (26.4)	11 (19.0)	37 (29.8)
Tricare, n (%)	1 (0.5)	0 (0)	1 (0.8)
Living situation			
Domiciled, n (%)	157 (82.3)	10 (17.2)	112 (90.3)
Nondomiciled, n (%)	22 (12.1)	45 (77.6)	12 (9.7)
ED primary complaint			
Pain, n (%)	88 (48.4)	26 (44.8)	62 (50)
Altered mental status, n (%)	1 (0.5)	1 (1.7)	0 (0)
Alcohol use, n (%)	7 (3.8)	3 (5.2)	4 (3.2)
Other substance use, n (%)	3 (1.6)	2 (3.4)	1 (0.8)
Psychiatric need, n (%)	11 (6.0)	4 (6.9)	7 (5.6)
Other, n (%)	72 (39.6)	22 (37.9)	50 (40.3)
Admission to hospital			
No, n (%)	138 (75.8)	43 (74.1)	95 (76.6)
Yes, n (%)	42 (23.1)	15 (25.9)	27 (21.8)

ED = emergency department.

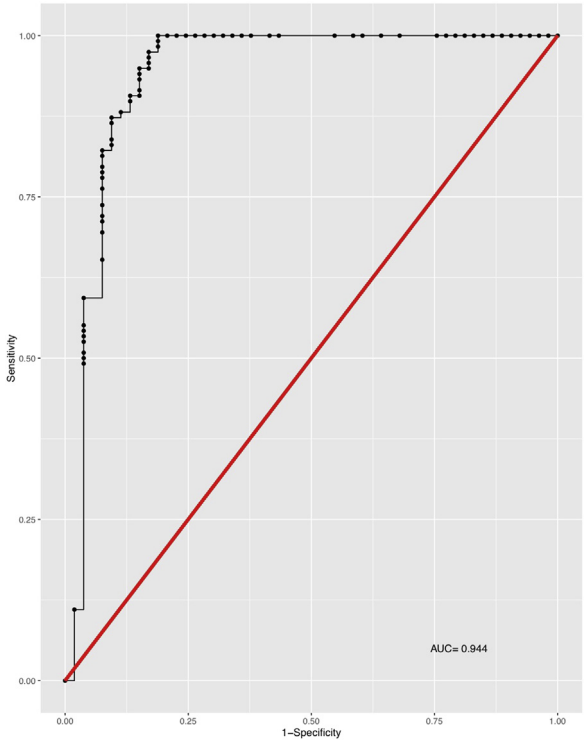

Figure 2. Receiver operating characteristic curve of naloxone screening and recommendation. AUC = area under the curve.

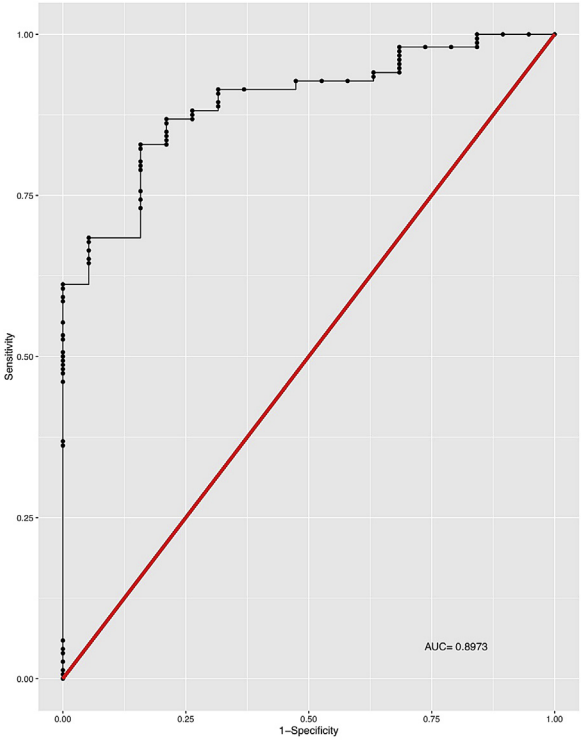

Figure 3. Receiver operating characteristic curve of naloxone screening and prescription. AUC = area under the curve.

naloxone recommendation and receipt. Each primary screening tool question was intended to have only a yes/no response, though in real-life application, this proved to be not always possible. This subanalysis reflects an ideal application of the screening tool, whereas the full data analysis reflects the screening tool applied in a real-life ED setting.

As a group, the subset of those prescribed naloxone did not reflect the group recommended naloxone. Although providers were recommended to prescribe naloxone to their at-risk patients (e.g., patients taking daily opiates and benzodiazepines, using opioids recreationally), ED providers have historically used naloxone as an intervention for suspected opioid-related overdose, and the culture of providing naloxone to those at risk for overdose is a new phenomenon to many (17). This has contributed to the slow uptake in naloxone prescription. Other factors that contributed to lower rates of naloxone prescribing based on provider comments include unfamiliarity with naloxone-prescribing guidelines, competing priorities in a fast-paced setting, and stigma against drug users. Further qualitative evaluation is under way to understand—and overcome—the prescribing patterns of providers. Regular education and reminders (i.e., verbal, e-mail, EHR) are required for process changes, like naloxone prescription. Additionally, increased support by hospital and department leadership could lead to improved provider awareness and prioritization of process changes. Facilitators and challenges in establishing an ED naloxone project is well documented and likely contributed to reduced naloxone prescriptions (18).

The use of the naloxone screening tool is an effective means to identify individuals for take-home naloxone, and more importantly, the application of the tool connects patients with naloxone. Both the ORT and the RIOSORD poorly predicted naloxone recommendation and prescription; this poor correlation reflects the shifting paradigm of overdose prevention in the medical setting. Beyond focusing on level of overdose risk and predicting overdose, our outcome measures must include how successfully any patient with overdose risk is connected to naloxone. This requires several important steps and outcome measures: 1) identify individuals with overdose risk as part of universal opioid-prescribing precautions; 2) discuss overdose prevention with patients; 3) prescribe patients or their family/peers with naloxone and train on its use; and 4) ensure accessibility of naloxone (19,20).

To assist with identifying individuals with overdose risk in addition to verbal screening, EHR decision support tools can remind providers to prescribe naloxone and

could facilitate overdose education and naloxone prescribing in settings where screening is not possible. However, this requires reliable EHR documentation. An overdose history is not regularly taken from patients, but discrete risk factors beyond an opioid prescription could be identified within the EHR. Finding methods to systematically answer high-yield screening questions in the EHR, along with factors identifying those at the highest risk of sedation, would facilitate provision of naloxone to the right patients.

Limitations

Limitations included the single-center site, use of a nonvalidated screening tool, selection bias of study participants, and lack of longitudinal follow-up with patients prescribed naloxone. This study was limited by its nature as a pilot project related to a quality-improvement initiative. Study participants represented a convenience sample, which may have introduced unknown bias. Components of the screening tool used at the bedside were derived from best practice, our institutional guideline, and a validated tool (the ORT). Chart review was completed retrospectively. This limited our ability to determine intentions for the prescription or nonprescription of naloxone for patients who were admitted. EHR data were incomplete and often at odds with patient-reported data from the survey. As this was a pilot intervention as part of a quality-improvement initiative, the tools for survey and chart review were selected to include a broad range of potential variables to develop a comprehensive data set; this may have introduced bias into the data. As the surveys were all completed by a single author (JD), although their administration was consistent, there was no chance to protect against threats to internal validity.

CONCLUSION

Routine screening for take-home naloxone can help identify patients at risk for opioid overdose based on our screening tool and can increase naloxone access in the ED setting. Routine screening can help identify individuals with overdose risk who might otherwise be missed, and facilitate discussion of overdose prevention and prescription of naloxone. Shorter screening containing two to three high-yield questions about opiate use and overdose history could be utilized in fast-paced settings. In addition, discrete data in EHRs such as opioid use history or opioid prescriptions can reliably help flag patients for a naloxone prescription.

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jemermed.2018.12.029.

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ARTICLE SUMMARY

1. Why is this topic important?

As opioid use is becoming a growing problem in the United States, the Emergency Department is seeing an increasing amount of opiate users and opioid-related complications, including overdose. The ED is at the front lines caring for individuals affected by the opioid-overdose epidemic, and sharing research and quality improvement efforts on overdose prevention is critical to help care for this population.

2. What does this study attempt to show?

This study attempts to show the process and outcomes of routine screening for overdose education and naloxone prescription in the emergency medical setting based on recommended naloxone prescribing guidelines.

3. What are the key findings?

The key findings are that routine screening for opioid-overdose risk increases naloxone prescription and access in the ED setting, and can help identify individuals with overdose risk who might otherwise be missed.

4. How is patient care impacted?

Patient care is impacted by 1) asking patients questions related to their current or past opioid use, overdose history, and peer network, 2) discussing overdose risk, prevention and intervention and 3) providing prescription of naloxone, a life-saving antidote for opioid-related overdose.