Improving Intranasal Naloxone Prescribing Through EMR Modification and Automation

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Background: In 2017, approximately 11.4 million Americans used opioids inappropriately. Nearly 47,600 deaths in 2017 were attributable to overdose on opioids. Intranasal naloxone was approved by the Food and Drug Administration in 2015 as a rescue medication for opioid overdose. New York State launched a prescription drug monitoring program in 2012, the Internet System for Tracking Over-Prescribing (I-STOP), that required completion before dispensing any controlled substance. Currently, prescribing naloxone at our institution requires 10 clicks and 2 free text boxes. The goal of this project was to increase the prescribing of intranasal naloxone by utilizing EMR automation and visualization tools.

Methods: Our intervention embedded a section within the required I-STOP note, displaying the last date naloxone was prescribed and an option to ''prescribe intranasal naloxone.'' If checked, a prepopulated order dialog box was generated.

Results: Intranasal naloxone orders for the institution totaled 65 for 2 months before the intervention and 203 for 2 months after the intervention, with 112 (55%) coming directly from the I-STOP note modification. Ease of prescribing improved as total clicks were reduced from 10 to 2, and free text boxes from 2 to 0.

Conclusions: Our findings suggest that a clinical decision support system can be an effective way to increase hospital-wide naloxone prescribing rates. We were able to increase prescribing rates by more than three-fold, significantly increasing the availability of a rescue medication to individuals at high-risk for overdose. Intranasal naloxone prescribing increased with the implementation of a visual reminder and a more intuitive ordering experience while preserving provider autonomy.

Key Words: clinical decision support, intranasal naloxone, opioids, prescription drug monitoring program

(*J Addict Med* 2021;15: 181–186)

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Received for publication May 25, 2020; accepted July 27, 2020.

The authors have no conflicts of interests to disclose.

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ISSN: 1932-0620/20/1503-0181

DOI: 10.1097/ADM.0000000000000724

In 2017, an estimated 11.4 million Americans used opioids outside of prescription criteria, including 11.1 million using pain relievers and 886,000 Americans who used heroin.[1] Nearly 47,600 deaths in 2017 were attributable to overdose on prescription or illicit opioids, totaling nearly 130 deaths per day.[2] Most of these overdoses were accidental and not deliberate suicide attempts.[3] Overdoses on opioids were also found to occur often in the users' home and in the presence of others.[4,5] Wheeler et al have studied community-based opioid overdose programs from 1996 to 2010. They identified barriers to their implementation, such as inability to provide naloxone, whether due to cost or supply. Their survey found that larger programs provided more of the naloxone to patients. The report suggests that naloxone distribution and training might prevent numerous overdose deaths.[6,7] Further studies showed that the number of programs distributing naloxone more than doubled from 2010 to 2015 and that more naloxone is being distributed to laypersons. Programs which provide naloxone in the community have also been demonstrated to reduce overdose deaths.[8] During the 12 months following a nonfatal overdose, the rate of repeat overdose was 295 per 1,000 person-years in regular opioid users.[9]

Naloxone is a specific opioid receptor antagonist with high affinity for the mu-opioid receptor and is used clinically to reverse an opiate overdose or the respiratory and central nervous system depressant effects of the opioid. Intranasal naloxone was approved by the FDA in late 2015 as a rescue medication for opioid overdose in the community, specifically by medically untrained first responders, when intravenous administration was not possible.[10] Research has suggested statistically significant patient recovery benefits for the use of intranasal naloxone when administered by an untrained bystander.[11] With overdose management training, opioid users have demonstrated the capability of successfully administering intranasal naloxone during a witnessed opioid overdose in others, further supporting a wider distribution of intranasal naloxone to users.[12] In a pilot overdose prevention and reversal program, 11 of 22 participants had witnessed a total of 26 overdoses in 3 months, and the observers administered naloxone on 10 occasions; all users who received naloxone lived.[13]

According to the CDC's HI-5 model (Health Impact in 5 years), achieving a lasting impact on health outcomes requires a multifaceted approach. Involving patient care as well as community-wide approaches aimed at improving population health is essential.[14] Components of this model have already

been implemented for the opioid epidemic such as targeted public information campaigns about signs of overdose and available rescue medications as described above; tools that track opioid prescriptions and limit overprescribing; and systems that increase the availability of rescue medications to the public. In 2013, the Veterans Health Administration implemented several programs to address inappropriate opioid prescribing, such as the Opioid Safety Initiative, Opioid Overdose Education and Naloxone Distribution, and have utilized academic detailing to educate providers on the inherent risks of chronic opioids.[15]

A Prescription Drug Monitoring Program (PDMP) is an electronic database that tracks controlled substance prescriptions in a state. PDMPs were formed to prevent patients from being able to visit multiple providers in their area, or ''doctor shopping'' and receive multiple concurrent prescriptions for controlled substances. New York State implemented a PDMP, called the Internet System for Tracking Over-Prescribing (I-STOP) in 2013, mandating clinicians to consult the statewide database to review the patient's prescription history before prescribing any controlled substance. Although prescription opioid morbidity has plateaued following the launch, morbidity related to a heroin overdose and illegally obtained opioids continued to rise.[16] Other state PDMPs have noted a more than 30% reduction in the rate of prescribing opioids.[17]

PDMPs fall under the same category of technology called Clinical Decision Support Systems (CDSSs), which are tools used to assist providers in making clinical decisions. Clinical Decision Support Systems have been extensively studied in the last 20 years and are widely touted as an enhancer of clinical performance and medical care, often improving practitioner performance by 64% to 68%.[18–21] CDSSs can take many forms in the medical field, often being integrated into the clinical workflow, providing decision support by making medication dosing recommendations, providing treatment algorithms, and using alerts/reminder cues at the time and location of care.[20,22] Bright and colleagues evaluated 148 randomized controlled trials of CDSSs and found both commercial and locally developed support systems improve health care measures across diverse settings, but evidence on the clinical and economic outcome is sparse.[23] In the emergency department setting, electronic medical record (EMR) prompts have been proven to increase take-home intranasal naloxone for patients discharged after opioid overdoses.[24] Taking into account the effectiveness of similar CDSSs in the emergency department setting, we believe success can be expanded into the ambulatory care setting as well.

At the James J. Peters VA Medical Center located in the Bronx, NY, to prescribe an opioid medication and have it dispensed by our pharmacy, an I-STOP note must first be completed. To prescribe intranasal naloxone simultaneously with the opioid, the physician must (1) remember to prescribe the medication, (2) select the order tab, (3) select outpatient medications, (4) type naloxone in the free text box, (5) select the intranasal route of the medication, (6) fill out the dose, (7) fill out the quantity, (8) fill out the number of days' supply, (9) select ''pickup at window,'' and (10) sign the order, consuming valuable time and energy of providers. The objective of this project was to focus on system-based change to increase the prescribing of intranasal naloxone for the entire institution. We hoped to achieve this by utilizing a clinical decision support system built into the hospital system's I-STOP template, capitalizing on EMR automation and visualization, and streamlining the ordering process.

METHODS

The IRB chairperson pre-reviewed the study and made the determination that this is classified as a quality improvement project, not human subject research, thus not requiring IRB oversight. A needs assessment was performed which identified a need to increase the prescribing of intranasal naloxone at a facility level. The current prescribing method was analyzed by Quality Improvement officers, EMR programmers, pain management physicians, and preventive medicine physicians. Methods were strategized to reduce the number of steps necessary to prescribe naloxone while offering a reminder as a visual cue.

A clinical decision support system that launched on July 1, 2019 was agreed upon and embedded in a section within the I-STOP note (Fig. 1). It is a strict requirement in our facility that an I-STOP note must be completed before a controlled substance will be dispensed by our pharmacy. It displayed the most recent date intranasal naloxone was prescribed (if ever), as well as a checkbox that allowed the provider to ''prescribe intranasal naloxone.'' If checked, an order dialog box was generated, prepopulated with dose, quantity, route, refills, and prescription details (Fig. 2). The final step for the provider would be to click ''accept order'' and sign the order to finalize the process.

RESULTS

All naloxone orders for the 2 months prior (May 1, 2019–June 30, 2019) to launching the clinical decision support system totaled 65 for the entire institution. In the two months after (July 1, 2019–August 31, 2019) launching the intervention, total naloxone orders increased to 203, a 312% increase (Fig. 3).

Of the 89 naloxone orders in the first month postintervention, 49 (55%) orders resulted from the I-STOP note ''prescribe intranasal naloxone'' checkbox. Of the 114 orders in the second month postintervention, 63 (55%) naloxone orders resulted from this prescribing box.

When analyzing which departments were utilizing the ordering tool, we noted 88 of the 112 (78.5%) naloxone orders originating from the I-STOP ordering tool were coming from the Physical Medicine and Rehabilitation (PMR) clinic within the institution (Fig. 4). Two of the 112 naloxone orders came from primary care, ten from mental health, four from surgery, one from anesthesia's pain clinic, one from spinal cord clinic, and 6 from ''other'' clinics.

A total of 20 providers used the I-STOP note ''prescribe intranasal naloxone'' checkbox to order intranasal naloxone for their patients in the 2 months postintervention. Of the 20 providers, the top 3 providers ordered a combined total of 76 intranasal naloxone prescriptions through the ordering tool, meaning 3 of the 20 providers accounted for 67% of the intranasal naloxone ordering via the newly implemented ordering tool.

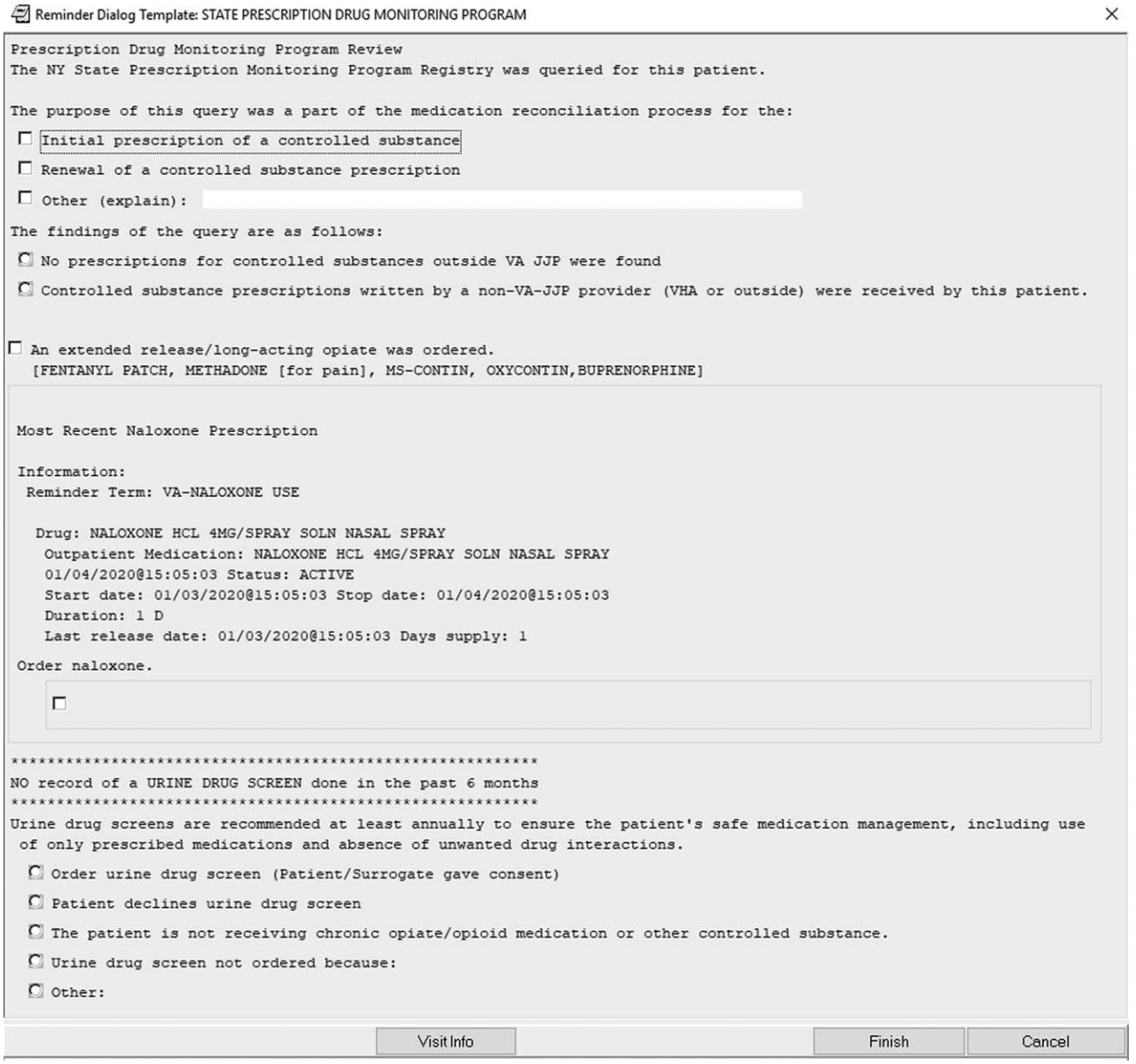

FIGURE 1. Clinical Decision Support Systems built into Internet System for Tracking Over-Prescribing note template.

DISCUSSION

Our findings suggest that a clinical decision support system that grants providers the ability to order intranasal naloxone expediently and efficiently can be an effective way to increase hospital-wide naloxone prescribing rates. At our institution, we were able to increase prescribing rates by more than three-fold, significantly increasing the availability of a rescue medication to individuals at high-risk for overdose. This data reflects similar research in CDDSs for prescribing since it is well established that putting alerts in the correct place in the prescriber's workflow facilitates the chance of them being acted on. The integration of our CDDS into the preexisting I-STOP note streamlined the process since ordering controlled substances at our hospital necessitated completion of a PDMP, and I-STOP was already built into provider workflow.

The vast majority of naloxone prescriptions originating from the I-STOP note modification occurred in the outpatient clinic setting. Nearly 67% of naloxone orders postimplementation came from only 3 providers, all from the PMR clinic. Only one of those 3 providers were on the implementation team. This prescribing trend is likely explained by the culture of our institution, where pain requiring more than 1 month of pharmaceutical intervention is customarily referred to the PMR clinic for chronic management. The PMR clinic's welcoming use of the CDSS also bodes well for the usability component of our implementation since there was no formal training for the PMR providers, yet they were able to benefit

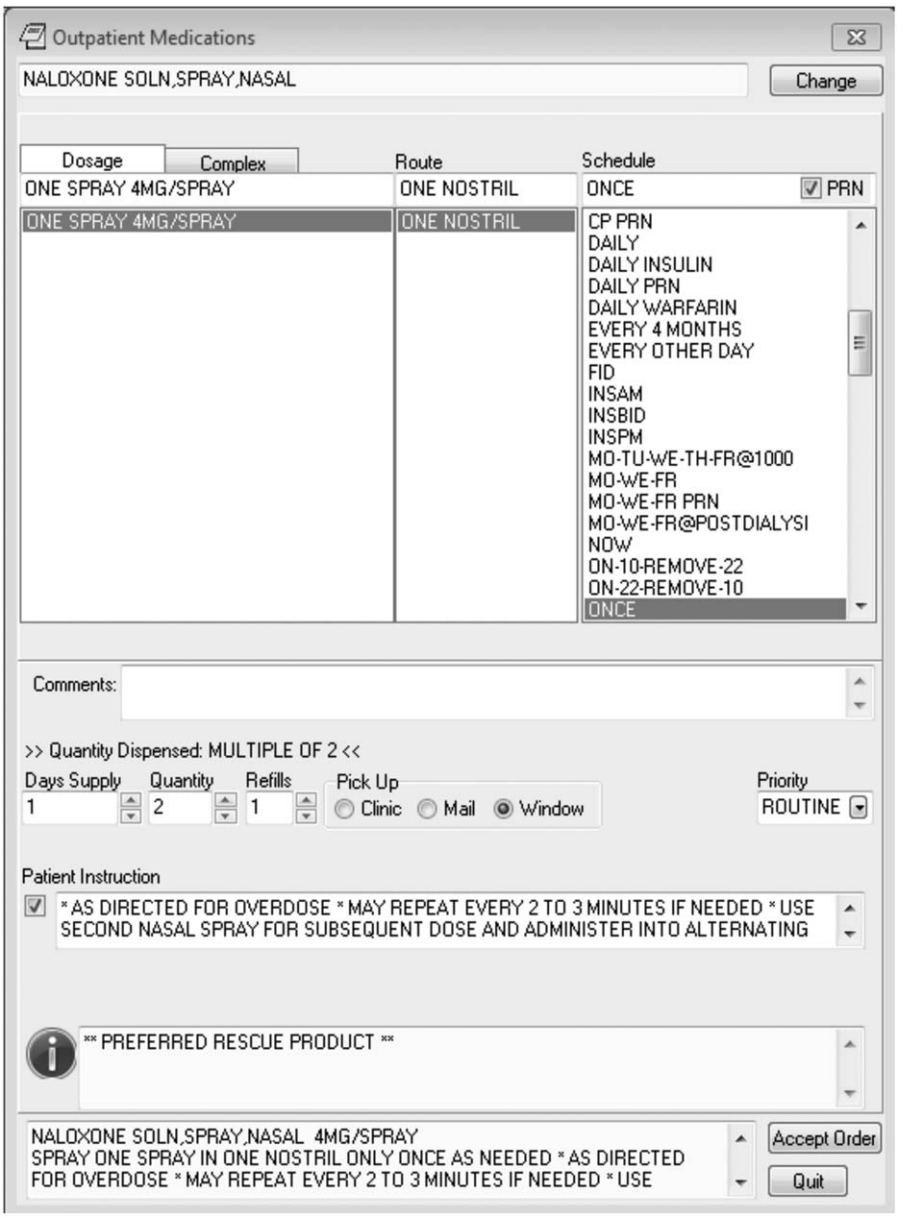

FIGURE 2. Intranasal Naloxone order, prepopulated.

from the ease of use and functionality of the implementation since it was built into their workflow. Reproducibility of this project at other institutions would depend on the culture of each institution regarding opioid prescribing practices. Current research suggests that primary care providers account for 37.1% of all opioid prescriptions, with nonphysician prescribers accounting for 19.2% and pain medicine specialists accounting for 8.9%.[25] The model described in this work is physician-implemented. Another initiative which implemented a combined interdisciplinary (physician, nurse, pharmacist) team-based naloxone harm reduction system using alerts in the EMR has been described in large academic health system and increased their naloxone prescribing by tenfold.[26]

One of the limitations of this study was the EMR, Computerized Patient Record System (CPRS), that the VA hospital utilizes. Since CPRS was one of the earliest EMR's developed, many of the functionalities of newer based EMRs cannot be achieved as seamlessly. As a result, we had to find a creative way to integrate the naloxone ordering dialog box into the provider workflow without being too intrusive. We chose to include the ordering box on the required I-STOP note, but we believe this could be more elegantly placed in newer EMRs such as have the naloxone order checkbox appear alongside any opioid order. Reproducibility of this implementation would depend on the workflow and EMR setup at other institutions. We were able to implement this

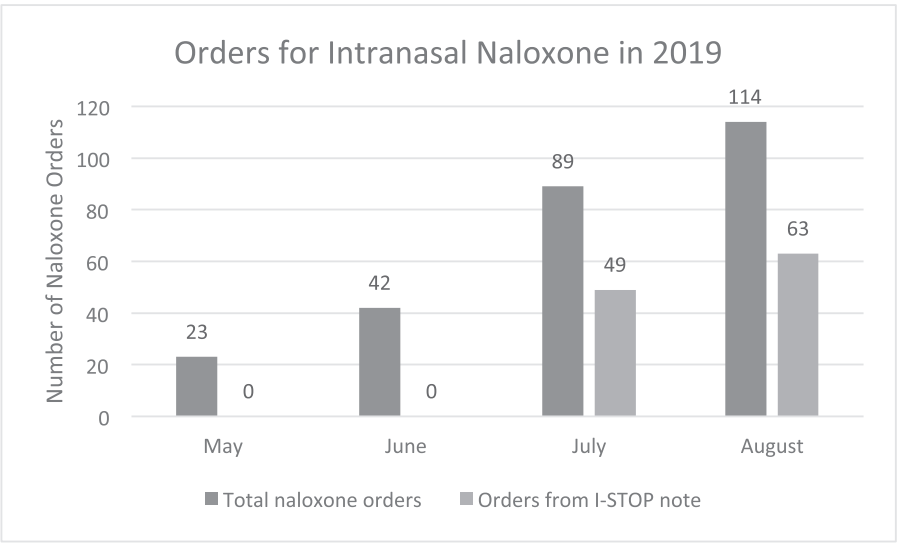

FIGURE 3. Number of intranasal naloxone orders for the entire institution, by month.

change without a strong educational component because it was embedded in a required workflow process.

A potential limitation for expanding this to outside institutions is the requirement of the I-STOP note to be completed before filling a prescription at our in-house pharmacy. As part of VA policy, pharmacists will not dispense controlled substances until they review the patient's chart and ensure the provider reviewed the prescription drug monitoring program of the corresponding state. Although an I-STOP note is required by New York State before prescribing controlled substances, there is no interoperability between pharmacies and providers to ensure it has been completed. At other institutions where dispensing of medication is not reliant on an in-house outpatient pharmacy, it would be challenging to incorporate a CDSS of this nature. This is especially relevant for future policy change in America, with hopes that pharmacists could be granted freedom to provide intranasal naloxone as a rescue medication similar to how levonorgestrel (Plan B) is available over the counter for pregnancy prevention.

An additional feature of CDSSs to be utilized for future research include the use of targeted naloxone recommendations based on overdose risk calculators. The VA currently uses an opioid risk model calculator called the Stratification Tool for Opioid Risk Mitigation (STORM) that uses demographic, diagnostic, pharmacy, and health care utilization data to predict the risk of overdose or suicide-related health care

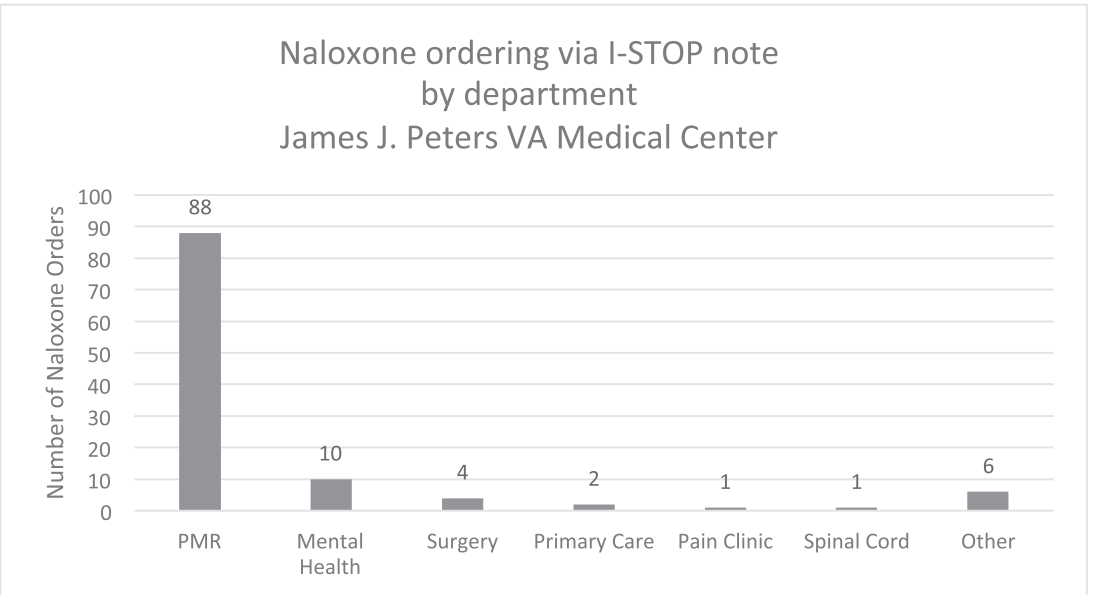

FIGURE 4. Number of intranasal naloxone orders originating from Internet System for Tracking Over-Prescribing note, by department.

events or death in the next year.[27] The VA has also been used as a model to develop a Risk Index of serious opioid-induced respiratory depression (RIOSORD)[28]; this model was subsequently validated for a commercial health plan as well.[29]

CPRS does have a CDSS currently called "clinical reminders," which are support tools that populate for different patients depending on their demographics, their current medications, and other collected data stored within the EMR. A clinical reminder was successfully launched throughout the Veterans Health Administration Sierra Pacific Network which reduced the morphine equivalent monthly dose for patients.[15] A similar clinical reminder implemented across the hospital system that triggered if a patient was being prescribed opioids monthly for chronic pain and recommended coprescription of intranasal naloxone may prove to be beneficial.

CONCLUSIONS

The clinical decision support system that was created within CPRS, increased the prescribing rate of intranasal naloxone in patients at high-risk for overdose. While this project met its objectives, future iterations may focus on the implementation of clinical reminders as previously described. As features of EMRs are honed, more sophisticated targeting of high-risk patients through population health data evaluation will contribute to overall patient health outcomes.

ACKNOWLEDGMENTS

Adelina Fuentes-Ramos, thank you for your contribution to building out the CDSS. Andrew Bean, thank you for your contribution to the data analysis portion of this project.

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