limitation includes potential for a Hawthorn Effect, because the transport crews and hospitals may have altered their behavior during the course of data collection as they were aware of data collection [3]. Also, because CRPC members provide follow up in real time, the incidence of problematic events may have decreased over time. This is a desired outcome consistent with the CRPC mission to improve pediatric emergency care through ongoing monitoring and feedback. However, while the overall incidence decreased over the course of the study, problematic transports continued to occur at unpredictable rates. Finally, because there is a subjective component to choosing mode of transport, mode-of-transport problems may be decreased by more objective criteria.

In conclusion, we have identified characteristics associated with problematic pediatric transports to a children's hospital ED. Problematic transports are not rare, as they occur approximately every 3 days. The most common patient is the young male child, and choice of mode of transportation is the most frequent variable associated with these transports. Overall, the top five causes comprise 35.3% of all the problems encountered. Age was associated with circulatory problems during transport after adjustment for gender and location of referring facility, such that each increase in age of 1 year was associated with a 10% increased odds of hemodynamic instability. This knowledge might facilitate targeted education toward agencies that transport critically ill children.

Author disclosure statements

Dr. Arnold had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. The authors have no conflicts of interest to disclose.

Conflicts of interest

None.

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References

[1] Harris PA, et al. Research electronic data capture (REDCap)–a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform 2009;42(2):377–81.
[2] Guidelines for Air and Ground Transport of Neonatal and Pediatric Patients. In: Woodward GA, editor. American Academy of Pediatrics, 3rd Ed. ; 2007 [ISBN-10: 1-58110-219-4].
[3] Wickstrom G, Bendix T. The "Hawthorne effect"–what did the original Hawthorne studies actually show? Scand J Work Environ Health 2000;26(4):363–7.

Naloxone prescriptions from the emergency department: An initiative in evolution

It is well known that the United States is currently in the midst of an Opioid Epidemic. Drug overdose has become a leading cause of death in the United States [1]. To help address the epidemic, the United States Department of Health and Human Services has made expanded use and distribution of naloxone one of their priority areas to combat opioid abuse [2]. Specialty societies have also endorsed the expansion of naloxone education and distribution [3].

Our institution developed a hospital-based naloxone distribution program in 2011 to expand distribution and use of naloxone to patients at risk of overdose visiting our emergency department (ED). In the original iteration of our program we conducted training and prescribing of naloxone at the bedside in the ED. As the program expanded to include our ED, inpatient units, and all health-system clinics, it transitioned to the provider simply writing a prescription to be filled in the pharmacy where training would also be completed.

We conducted a retrospective chart review for all ED encounters where a naloxone prescription was generated from January 4 to August 31, 2017. Each encounter was abstracted for: patient age, sex, ED diagnosis, if the naloxone prescription was brought to our attached outpatient pharmacy, and if the naloxone training and education was provided by an outpatient pharmacist. The primary outcome was the proportion of patients that obtained naloxone from our pharmacy after receiving a prescription in the ED. We also planned to compare successful naloxone obtainment between patients with an ED diagnosis of overdose and patients with an alternative diagnoses and between patients given naloxone plus additional prescriptions and patients given only a naloxone prescription. This study received IRB exempt status.

A naloxone prescription was provided by the ED for 55 unique patient encounters during the study period. The mean age of the patients was 48 years old and 75% were male (Table 1). Among the 55 naloxone prescriptions written, 14 (25.5%) prescriptions were documented as received at the outpatient pharmacy. Ultimately, only 10 (18.2%) prescriptions were obtained. We did not identify a difference in successful prescribing of naloxone between patients with a primary ED diagnosis of heroin overdose versus other diagnoses. It is notable, we identified about a 10% higher rate of successful prescribing for patients given additional prescriptions plus a naloxone prescription (Table 2).

Given the opioid epidemic's burden on the healthcare system and the frequency of patients presenting to the hospital, the ED is poised to be actively involved in this public health response. Community-based naloxone programs have been active for two decades, but prescribing naloxone for home use is a newer concept in Emergency Medicine [4]. In the community, a patient is provided overdose and naloxone education and typically receives naloxone immediately [5]. This could

Table 1
Demographics.

Demographic	Number of patients (n = 55)
Age (mean, SD)	48 (12)
Male (%)	41 (74.5)
Primary diagnosis of heroin overdose (%)	22 (40)
Alternative primary diagnosis (%)	33 (60)
Received other prescriptions plus naloxone prescription (%)	25 (45.5)
Received only a naloxone prescription (%)	30 (54.5)

Table 2
End result of naloxone prescription.

Prescription outcome	Number of patients
Brought naloxone prescription to pharmacy, (%)	14 (25.5)
Completed training and obtained naloxone (CTON), total (%)	10 (18.2)
CTON with primary diagnosis of overdose, (%)	4 (18.2)
CTON with other diagnosis than overdose, (%)	6 (18.2)
CTON and had other prescriptions, (%)	6 (24)
CTON and only had a naloxone prescription, (%)	4 (13.3)

be considered the gold standard for delivery where one patient trained equals one equipped to prevent an overdose death. These programs are associated with improving survival from an overdose [5]. The hospital environment is a much more complicated entity, and must follow regulations that can preclude easy dispensing of medications such as naloxone for out of hospital use. Medications intended for home use must involve a licensed pharmacy unless a more complicated process is developed in the ED to be in compliance with state prescribing and dispensing regulations. Given the constraints of the hospital ecosystem we have identified a barrier to deliver naloxone to patients for out of hospital use as successfully as community-based programs.

Another potential barrier to successful receipt of medication is the cost of a minimal dispensing fee charged at our pharmacy; however this can be waived one time for patients without the ability to pay. The major problem in our series is patients did not present to the pharmacy as expected. Understanding why the adherence with the process is poor in this patient population is multifactorial.

In light of this data, point-of-care delivery systems of naloxone should be developed. This may be accomplished by manually logging all dispensing in accordance with hospital policy and state regulations. However, this will add additional administrative burdens on an already busy ED staff. Additional steps should be taken at the legislative level to simplify point-of-care distribution by amending pharmacy and provider practice acts. This is needed in order to combat the opioid epidemic.

To our knowledge, this is the first retrospective study evaluating the rate of naloxone obtainment with a standardized process of prescribing in the ED and dispensing from an onsite pharmacy. We have provided observational evidence that even with a standardized process in place to expand the distribution of naloxone to a vulnerable patient population, the ability of patients to obtain the life-saving medication is poor. Hospital-based prescribing is complex, but hospital-based delivery of naloxone must become as efficient in delivery as community-based programs.

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References

[1] Rudd RA, Seth P, David F, Scholl L. Increases in drug and opioid-involved overdose deaths — United States, 2010–2015. MMWR Morb Mortal Wkly Rep 2016;65:1445–52. https://doi.org/10.15585/mmwr.mm655051e1.
[2] US Department of Health and Human Services. Actions to address opioid-drug-related overdoses and deaths. J Pain Palliat Care Pharmacother 2015;29:133–9.
[3] Doyon S, Aks SE, Schaeffer S. Expanding access to naloxone in the United States. Clin Toxicol (Phila) 2014;52(10):989e992.
[4] Sporer KA, Kral AH. Prescription naloxone: a novel approach to heroin overdose prevention. Ann Emerg Med 2007;49:172–7.
[5] Adams JM. Increasing naloxone awareness and use the role of health care practitioners. JAMA April 05, 2018;319(20):2073–4 Published online https://doi.org/10.1001/jama.2018.4867.

The electrocardiogram in pulmonary embolus: Diagnostic applications

To the Editor,

We read the article by Omar et al. [1], with great interest. We would like to stress the importance and usefulness of electrocardiographic (EKG) changes in pulmonary embolism (PE), as these were not brought out by the authors [1]. The authors may state that EKG is neither sensitive nor specific to confirm or refute the diagnosis of PE, as it may be normal in around 18% of PE [2]. Invariably EKG of PE patients may reveal features of S1Q3T3, new RAD, RBBB or T-wave inversions which shall make the treating physician to suspect PE, and proceed for further diagnostic testing [3] and intervention.

In fact, Daniel's [4] twenty-one-point EKG scoring system has a sensitivity and specificity of 23.5 and 97.7% respectively to recognize high risk PE and the severity of pulmonary hypertension too.

Meta-analysis of over 3000 patients of PE, Qaddoura et al. [5], identified six key EKG findings to prognosticate PE and majority of their findings overlapped with Daniels [4] score. Quite a few other studies [6-9] have confirmed the predictive value of ST elevations in lead aVR and described these as an independent predictor of mortality in PE. Furthermore, T wave inversions in both lead III and v1 (the two rightmost leads) occurs more frequently in PE with 88% of patients, but 1% of patients with ACS [10].

In addition, several EKG findings have an odds ratio for circulatory collapse [11] which is higher than echo findings of RV strain or an elevated troponin. Radiologically, confirmed cases of PE too had EKG changes. Moreover resolution of anterior T-wave inversion was considered as a possible marker of pulmonary reperfusion following thrombolysis.

To conclude, EKG is less expensive and helpful at the bedside to suspect and manage pulmonary embolism especially in resource limited environ and more so those with syncope of undetermined origin and also helped for risk stratification.

Above all, students of health sciences were taught and trained to look/search for EKG changes in PE. Hence, their knowledge shall be utilized towards diagnosis, risk stratification and intervention. Since EKG changes portend poor prognosis, care givers shall be informed about the possible outcome in the era of enhanced expectations from care providers.