71 patients were identified as candidates. 17 (24%) denied a history of opioid use, 11 (15%) declined, and the remaining 43 were appropriate for inclusion. Of these, the treating physician refused to prescribe naloxone for 16 (37%), 2 (5%) already possessed naloxone, and 1 (2%) clinically deteriorated and was no longer able to participate. The remaining 24 (56%) were enrolled (Fig. 1).

At the 3 month follow-up, 7 (29%) participants were successfully contacted, of which 2 (29%) had chosen to fill their prescription. None reported obstacles to obtaining naloxone.

4. Limitations

Our sample size was small and larger studies would be necessary to generalize our results. The harm reductionist team had hospital privileges by virtue of being medical students and did not require funding, which may not be true elsewhere. Therefore, other programs may require further steps to incorporate harm reductionists into the ED. Larger studies may also be able to demonstrate the effectiveness of specific educational tools in the emergency setting and their translation to real-world overdose response.

5. Discussion

The greatest barrier to naloxone prescription in our study was physician resistance, despite the program being approved by the department chair and research director. This underscores the need to improve physician education about the efficacy of harm reduction. Our study implies that commonly stated objections (such as time constraints and inadequate staffing) may be only part of the cause for physician opposition to harm reduction interventions.

This study demonstrates that collaborations between an ED and community harm reductionists without formal credentials can result in delivery of meaningful overdose prevention education and naloxone to patients without compromising their care or ED throughput. As many departments lack the staff, funding, resources, and knowledge to develop a comprehensive harm reduction program, our approach offers a potential alternative. We encourage harm reduction programs with sufficient resources to consider reaching out to local hospitals to expand the scope of harm reduction services.

Although the majority of eligible patients received our educational intervention and a naloxone prescription, few filled that prescription. Due to internal pharmacy policies, we had been unable to provide take-home naloxone directly at discharge, and we believe this led to the low portion of participants ultimately obtaining naloxone. We recommend that future similar programs provide naloxone directly to participants, and attempt to understand factors causing emergency physician hesitance to prescribe naloxone.

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None.

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References

[1] Chen JH, Humphreys K, Shah NH, Lembke A. Distribution of opioids by different types of Medicare prescribers. JAMA Intern Med 2016;176:259–61. https://doi.org/10.1001/jamainternmed.2015.6662.
[2] Rudd RA, Seth P, David F, et al. 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.
[3] Barnett ML, Olenski AR, Jena AB. Opioid-prescribing patterns of emergency physicians and risk of long-term use. N Engl J Med 2017;376:663–73. https://doi.org/10.1056/NEJMsa1610524.
[4] Butler MM, Ancona RM, Beauchamp GA, et al. Emergency department prescription opioids as an initial exposure preceding addiction. Ann Emerg Med 2016;68:202–8. https://doi.org/10.1016/j.annemergmed.2015.11.033.
[5] Cantrill SV, Brown MD, Carlisle RJ, et al. Clinical policy: critical issues in the prescribing of opioids for adult patients in the emergency department. Ann Emerg Med 2012;60:499–525. https://doi.org/10.1016/j.annemergmed.2012.06.013.
[6] McDonald R, Strang J. Are take-home naloxone programmes effective? Systematic review utilizing application of the Bradford Hill criteria. Addiction 2016;111:1177–87. https://doi.org/10.1111/add.13326.
[7] Masson CL, Sorensen JL, Perlman DC, et al. Hospital- versus community-based syringe exchange: a randomized controlled trial. AIDS Educ Prev 2007;19:97–110. https://doi.org/10.1521/aeap.2007.19.2.97.
[8] D'Onofrio G, O'Connor PG, Pantalon MV, et al. Emergency department-initiated buprenorphine/naloxone treatment for opioid dependence: a randomized clinical trial. JAMA 2015;313:1636–44. https://doi.org/10.1001/jama.2015.3474.
[9] Dwyer K, Walley AY, Langlois BK, et al. Opioid education and nasal naloxone rescue kits in the emergency department. West J Emerg Med 2015;16:381–4. https://doi.org/10.5811/westjem.2015.2.2490.
[10] Samuels EA, Dwyer K, Mello MJ, et al. Emergency department-based opioid harm reduction: moving physicians from willing to doing. Acad Emerg Med 2016;23:455–65. https://doi.org/10.1111/acem.12910.

System-wide process changes improve procedural sedation billing in the pediatric emergency department

1. Introduction

Procedural sedation and analgesia is common in the emergency department (ED). Data from the Nationwide Emergency Department Sample found that at least 80 children are sedated in the ED every day across the United States, accounting for 0.1–1.5 sedation cases per 1000 visits [1,2]. Laceration repair, fracture reduction, and abscess incision and drainage are the top conditions requiring PSA in the ED [3]. PSA has been shown to be safe and effective in the hands of trained multidisciplinary practitioners in the ED [3,4].

PSA is complex, requiring close monitoring and the presence of a minimum of two providers [5–8]. Often the bedside nurse is responsible for monitoring physiologic parameters and assisting in any supportive or resuscitation measures. The PSA provider is responsible for the administration of medications and sedation oversight, while sometimes performing the procedure as well. The PSA provider must have sedation knowledge, ability to provide rescue techniques, apply monitoring described in guidelines such as those by the American Academy of Pediatrics, and manage complications for a level deeper than the intended sedation state [8].

PSA in the ED is resource intensive and disrupts regular patient flow. It requires parental preparation through informed consent, equipment set up, and documentation [8]. Thus, it is important to recuperate the costs through appropriate billing for both the sedation and procedure. We evaluated our sedation billing to identify the key billing gaps and underwent a quasi-experimental, quality improvement (QI) process to rectify these gaps and improve physician services charge capture.

2. Material and methods

We conducted a cross-sectional study of patients that received ketamine as a primary agent for PSA in the EDs of two urban, academic, free-standing children's hospitals in our hospital system. Data were divided into two groups: the pre-intervention group from July 1st 2014 through June, 30th, 2015; and the post-intervention group from August 1st, 2015 through July 31st, 2016. Data was not collected during the implementation period in July 2015.

2.1. Setting and population

The study was conducted at our main campus (MC), a quaternary urban, level 1 trauma center with an average of 75,000 ED visits annually, and our community campus (CC), a suburban community hospital with an average of 43,000 ED annual visits. These hospitals represent one of the largest free-standing children's hospital networks in the country.

Ketamine was the most widely used ED PSA agent administered by moderate sedation credentialed faculty. Our internal pharmacy database was queried to identify all patients that received ketamine for PSA. All patients that received ketamine outside the PSA indication were excluded: intubation in combination with a neuromuscular blocker, bronchodilation in asthmatic patients, or for non-procedural analgesia. Ketamine usage was cross-referenced to physician billing.

2.2. Intervention

We evaluated patients that received PSA over the initial year to delineate key sources of missed billing to improve charge capture. A multidisciplinary team of ED physicians, nurses and ancillary services identified several obstacles including documentation variation with an inconsistent reporting location for sedation start and stop time due to lack of provider template standardization; lack of physician sedation billing and documentation knowledge; and lack of electronic medical record diagnosis and procedure code linking.

Subsequently, a prospective QI project was designed to measure the impact of our interventions to improve documentation and charge capture for our 100 practitioners and 190 nurses in the ED. Demographic data were reviewed to include age, gender, procedure type, medication dosing, frequency of administration, provider type, financial information, and insurance status. Active moderate sedation billing codes at the time of the study included current procedural terminology (CPT) 99143-99150 [9].

We developed a targeted bundled intervention aimed at the 3 main components attributed to cases of missed billing. The first barrier was lack of documentation standardization. The most commonly utilized electronic medical record (EMR) template in use did not contain a location for PSA start and stop time. This made subsequent chart review difficult to locate sedation time, which is a mandatory component for the billing codes. We modified our EMR procedure note to clearly define the PSA time.

Second, we identified the need for timely administrative billing feedback to assist the busy clinical providers in adequate charge capture. Focused education was created to focus on the rapid identification of insufficient documentation with subsequent provider communication via email to improve correction in a timely basis. We worked with our physician services organization to assist in auditing these PSA charts. Additionally, our business process reviewer (BPR) systematically reviewed charts to verify if documentation was lacking. Our BPR reviewed a daily query from T-systems (4020 McEwen Road Dallas, Texas 75244), for any delinquent documentation in all provider encounters from the prior 24 h. PSA documentation accounted for approximately 15% of the 80–85 daily encounters. Our BPR reviewed PSA documentation for associated diagnosis linked to the procedure, calculated sedation length, and whether a separate sedation provider was present in addition to the proceduralist. The BPR would then audit this database two to five times a week, monitoring for inadequately billed PSA due to insufficient documentation. The providers were notified within seven days of the date of service and allowed addending the chart to ensure complete documentation.

The third component was the development of an educational initiative. Provider education was delivered in a multi-media manner via email, in-person lectures, and reminders on ED rounds. PowerPoint lectures were presented to all providers and fellows at the onset of the study, and several email blasts were sent with educational attachments in the first several weeks of July 2015. July 2015 was designated as the implementation of our 3-component bundle.

2.3. Data collection and processing

Our pharmacy database was queried and matched to PSA billing during the study time period. Age was positively skewed right (Shapiro-Wilk p-value < 0.001), therefore the Mann-Whitney test was utilized. Categorical comparisons were made using the Pearson Chi-Square test. A segmented linear regression analysis was chosen for this type of data with segment parameters defined as level change after intervention (β_2) and trend change after intervention (β_3). The primary outcome was the monthly sum of PSA charges. Secondary outcome measures included coding variation, stratified by site. Statistical significance was defined as a p-value <0.05. Analyses were conducted using Statistical Package for the Social Science (SPSS), version 24 (IBM Corp., Armonk, NY) and STATA, version 13 (StataCorp LP, College Station, TX).

3. Results

A total of 1602 patients received charges for PSA with ketamine out of the 2941 PSA procedures in the ED during the study period. The average age of the children undergoing sedation during the study period was 5.34 years (2.57–8.92). The pre-intervention timeframe was 07/01/2014 through 06/30/2015 (n = 353; 22.0%) and the post-intervention timeframe was 08/01/2015 through 07/31/2016 (n = 1249; 78.0%). There were no statistically significant differences in the demographics of the population over the study timeframe (Table 1). There were no significant differences in the demographics between eligible patients and those excluded during the implementation period July 2015.

Table 1
Demographic comparison between pre and post intervention timeframes (N = 1602).

	Pre-intervention 7/2014–6/2015 N = 353 (22.0%) Median (IQR) or N (%)	Post-intervention 8/2015–7/2016 N = 1249 (78.0%) Median (IQR) or N (%)	p-Value
Age (years)	5.34 (2.57, 8.92)	5.76 (2.59, 9.52)	0.34
Sex (female)	167 (47.3)	500 (40.0)	0.01
Location			0.97
Main campus	241 (68.3)	854 (68.4)	
Community campus	112 (31.7)	395 (31.6)	
Insurance status			0.20
Private	146 (41.4)	572 (45.8)	
Medicaid/public	165 (46.7)	560 (44.8)	
Self-pay	42 (11.9)	117 (9.4)	

Before the intervention, there was a significant difference from month to month in sum charges (p-value < 0.001) (Fig. 1). Over time, monthly sum charges increased by $1388.81 (95% CI: 952.57–1825.06). After the intervention, average ketamine charge summation increased by $1210.02 per month. There was no significant change in the month-to-month trend after the intervention (p-value = 0.15). There were PSA charges for 329 patients in the pre-intervention compared to 1132 post-intervention; nearly a four-fold increase in patients being billed (Table 2). The PSA billing for the pre-implementation period had a significantly lower monthly charge mean of $6054.55 (SD ± $5723.00) compared to a monthly charge mean of $20,600.00 (SD ± $4355.56) in the post period (p-value < 0.001). We also decreased our percentage of "No Charge" by >15% from pre- to post-intervention.

Secondary outcomes were a subgroup analysis for CPT coding. Instead of using monthly dollar charges, each individual amount was coded as a charge (yes/no). A $0.00 was coded as not being charged, and any dollar amount >$0.00 was coded as a charge. CPT codes were collapsed into two provider categories: same physician providing both the sedation and the procedure or different physician providing the sedation than the procedure. There were significant differences within each timeframe (pre/post) between physician type and charge (y/n) (p-value = 0.04 and p-value < 0.001, respectively) (Table 2). When a different physician provided the sedation while another performed the procedure, this code had a higher percentage of no charges than when the same physician provided both the sedation and the procedure. It is likely that we billed for the procedure charge only and not the sedation. When considering the effect of pre/post intervention, there was no significant difference in frequency of charges whether the provider did both the sedation and procedure or only the sedation (Breslow-Day p-value = 0.44).

Table 2
Current procedural terminology (CPT) coding and frequency of ketamine charges between pre and post study timeframes (N = 1602).

Study period	CPT type	No charge N (%)	Charge N (%)	p-Value[a]
Pre 7/14–6/15	Same provider[b]	21 (87.5)	320 (97.3)	0.04
	Different provider[c]	3 (12.5)	9 (2.7)	
Post 8/15–7/16	Same provider[b]	84 (71.8)	1085 (95.8)	<0.001
	Different provider[c]	33 (28.2)	47 (4.2)	

[a] Pearson or Fischer chi-square.
[b] Same provider performing sedation and procedure.
[c] Different provider performing sedation than the procedure.

4. Discussion

Ketamine is the most widely used dissociative, sedative agent for children undergoing PSA in the ED [2,3]. Our bundled intervention targeted primarily ketamine moderate PSA in our ED. We reviewed previous billing data to identify the most significant gaps that could improve our ED PSA billing. We found that our bundled intervention led to increased monthly charges for PSA, and improved charges for CPT coding.

There was a delta of more than $4600, from pre to post-intervention for PSA billing per month. Our initial billing was - $3460.61 per monthly ketamine charge. After our targeted bundled intervention, we saw monthly charges of $1210.02. We have not achieved 100% billing for PSA, however this is a significant change in the right direction. Our secondary outcomes for CPT coding showed improvement in number of billed sedations, nearly four-fold from 329 to 1132. The total number of sedations hasn't changed significantly per year, and thus our effective billing capture is substantial.

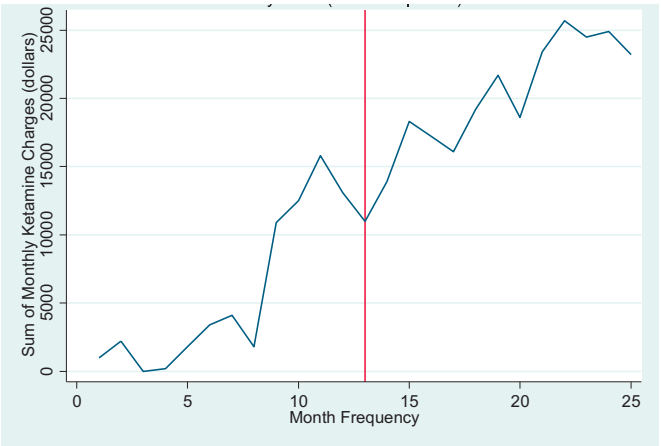

Fig. 1. Composite monthly sedation physician charges. Month 0 is July 2014 through Month 25 July 2016. The red line indicates the July 2015 implementation period.

We identified 4 major components to optimize billing: the creation of user-friendly EMR templates, monitoring provider compliance with the developed templates, physician billing education, and timely financial documentation feedback by administrative support. A tiered system involving the partnership of providers and the finance team allows for improved financial outcomes in a large quaternary medical system. The ED practice setting is quite demanding, and it is unrealistic for providers to bill efficiently and with 100% accuracy during their clinical shifts.

It is essential for providers to become more cognizant and involved in billing matters in medicine, especially the ED setting. Developing processes and clinical pathways that maintain high-level clinical care while providing fiscal responsibility are the hallmark of modern medicine. This is a rapidly growing area of medical research that will involve systemic process changes. While we were able to improve the EMR, opportunity still exists as even when highlighting a mandatory start and stop time within the uniform procedure note we were unable to create a process where the time in minutes for the sedation procedure auto-calculates. Each EMR-build is hospital specific and must be tailored to its needs.

There are several limitations to our study. We focused on a single hospital system and analyzed only our ketamine PSA billing. We were unable to conduct step-wise QI PDSA cycles over time to evaluate which aspect of our bundle resulted in the greatest improvement due to the need for a rapid intervention to improve charges. There is an increase in PSA charges beginning in March 2015, after a gap in billing was noted. This increase was likely due to preliminary discussions with leadership to increase awareness of the charge gap. Further work should be done to develop a multi-center protocol that can be implemented in various clinical settings to improve PSA billing. By standardizing charge capture for both high-volume quaternary centers as well as community hospitals that utilize a variety of sedation medications, pediatric PSA can consistently capture more of the financial benefits to justify this resource intensive procedure.

5. Conclusions

The implementation of a PSA bundle in our ED improved monthly charge capture by a delta of more than $4600 from pre to post-intervention. Our intervention bundle demonstrates that significant billing charge improvement can be obtained and sustained, with systemic process changes, provider education, uniform documentation templates, and implementation in the busy ED setting.

Appendix A. Full segmented regression model for monthly summations of Ketamine charges and the study intervention (N = 24)

Factor	Beta	95% CI	p-Value
Intercept (β_0)	−3460.61	−6671.28 to −249.93	0.04
Months (β_1)	1388.81	952.57–1825.06	<0.001
Intervention (β_2)	1210.02	−3071.70–5491.74	0.56
Time after intervention (β_3)	−443.71	−1060.65–173.24	0.15

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References

[1] Allareddy V, Rampa S, Auslendar M, Lowrie L. Trends in the Utilization of Moderate Sedation in Children in Emergency Departments in the USA. Oral Abstract Society for Pediatric Sedation; 2017 (Annual Meeting).
[2] Sacchetti A, Stander E, Ferguson N, Maniar G, Valko P. Pediatric Procedural Sedation in the Community Emergency Department: results from the ProSCED registry. Pediatr Emerg Care Apr 2007;23(4):218–22.
[3] Bhatt M, Johnson DW, Chan J, Taljaard M, Barrowman N, Farion KJ, et al. Risk factors for adverse events in emergency department procedural sedation for children. Sedation Safety Study Group of Pediatric Emergency Research Canada (PERC). JAMA Pediatr Oct 1 2017;171(10):957–64.
[4] Grunwell JR, Travers, CE McCracken, Scherrer P, Stormorken A, Chumpitazi CE, et al. Procedural sedation outside the operating room using ketamine in 22,645 children: a report from the pediatric sedation research consortium. Pediatr Crit Care Med Dec 2016;17(12):1109–16.
[5] Green SM, Roback MG, Kennedy RM, Krauss B. Clinical practice guideline for emergency department ketamine dissociative sedation: 2011 update. Ann Emerg Med May 2011;57(5):449–61.
[6] Godwin SA, Burton JH, Gerardo CJ, Hatten BW, Mace SE, Silvers SM, et al. Clinical policy: procedural sedation and analgesia in the emergency department. American College of Emergency Physicians. Ann Emerg Med Feb 2014;63(2):47–58.
[7] Gross Jeffrey, et al. Practice guidelines for sedation and analgesia by non-anesthesiologists. American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-Anesthesiologists. Anesthesiology Apr 2002;96(4):1004–17.
[8] Coté CJ, Wilson S, American Academy of Pediatrics, American Academy of Pediatric Dentistry. Guidelines for monitoring and management of pediatric patients before, during, and after sedation for diagnostic and therapeutic procedures: update 2016. Pediatrics 2016;138:1.
[9] CPT coding. AMA Website. https://www.ama-assn.org/practice-management/cpt-current-procedural-terminology. Copyright 1995-2018. Accessed October 2017.

Fentanyl-associated illness among substance users — Fulton County, Georgia, 2015

In early 2015, Hospital A emergency physicians subjectively noticed an increase in opioid overdoses presenting to the emergency department (ED) that corresponded with an increase in fentanyl-positive substance-related deaths documented by the Fulton County medical examiner (ME). This prompted Hospital A emergency physicians to begin selective fentanyl urine drug screening (UDS) for patients with clinical signs of opioid intoxication. After testing revealed that some patients had UDS positive for fentanyl, Hospital A began testing for fentanyl as part of all routine UDS in May 2015 and notified the Georgia Department of Public Health (DPH) of their findings. Fentanyl had not been commonly reported as associated with substance abuse and overdose in Georgia before this cluster. DPH initiated an epidemiologic investigation to characterize events and guide prevention efforts.

We performed a case-control study involving ED patients who presented during May 5–July 31, 2015, with acute, unintentional, substance-related illness or injury. A case was defined as UDS positive for fentanyl in addition to other opiates, cocaine, or amphetamine, in a patient who had no current or recent fentanyl prescription in evidence at the time of presentation. We also examined Fulton County ME data concerning substance-related deaths during August 1, 2013–July 31, 2015. UDS was performed on 3137 patients presenting to the ED during the study period; 254 (8%) were fentanyl positive, of which 79 were from patients who met all criteria to be classified as case-patients. Ninety-one control subjects were also included in the study. Table 1 summarizes characteristics of case-patients and control subjects. Case-patients were more likely than control subjects to have a presenting chief complaint of drug overdose (OR: 4.5; 95% CI: 1.6–12.0) or altered mental status (OR: 3.8; 95% CI: 1.2–11.5), as opposed to a

Table 1
Characteristics of case-patients and control subjects presenting to Hospital A emergency department in Atlanta, Georgia during May 5–July31, 2015 (N = 170).

	Case-Patients (n = 79)		Control Subjects (n = 91)			
	No.	%	No.	%	Odds Ratio	95% CI
Age range (median)	18–62 (35)		17–67 (41)			
Age group (yrs)						
<30	27	34	14	15	3.6	1.4–8.9
30–39	21	27	25	27	1.6	0.7–3.7
40–49	14	18	26	29	(ref)	(ref)
≥50	17	22	26	29	1.2	0.5–3.0
Male	59	75	62	68	1.3	0.7–2.6
Race (N = 148)[a]						
Black	39	49	72	79	(ref)	(ref)
White	22	28	15	16	2.7	1.3–5.8
Presenting chief complaint						
Drug overdose	21	27	11	12	4.5	1.6–12.0
Altered mental status	13	16	8	9	3.8	1.2–11.5
Psychological concern/suicidal	12	15	28	31	(ref)	(ref)
Addiction problem	4	5	3	3	3.1	0.6–16.1
Other	29	37	41	45	1.7	0.7–3.8
Transport, treatment, disposition[b]						
Received naloxone	26	33	8	9	5.1	2.1–12.1
Arrived by EMS	55	70	56	62	1.5	0.8–2.8
Admitted (e.g., medical, ICU, or psychiatric)	23	29	31	34	0.8	0.4–1.6

CI, confidence interval.
% total > 100 because of rounding.
[a] Four control subjects were of other or unknown race, and 18 case-patients were of other or unknown race; calculations are for patients of white or black race only.
[b] EMS, emergency medical services; ICU, intensive care unit. Odds ratio for each variable is the ratio of the odds of case-patients vs control subjects who had the experience vs. odds of case-patients vs control subjects who did not have the experience.