

Brief Report: A Pilot Quality and Feasibility Project Focusing on Clinician Use of an Order Set for Acute Asthma Care in Pediatric Urgent Care Centers

Urgent Message: There are limited data on implementation and use of clinical decision support tools for the evidence-based management of asthma in pediatric urgent care settings. In this pilot project, providing reports and feedback to clinicians on their use of order sets increased utilization of order sets but not adherence to best practice guidelines for asthma care.

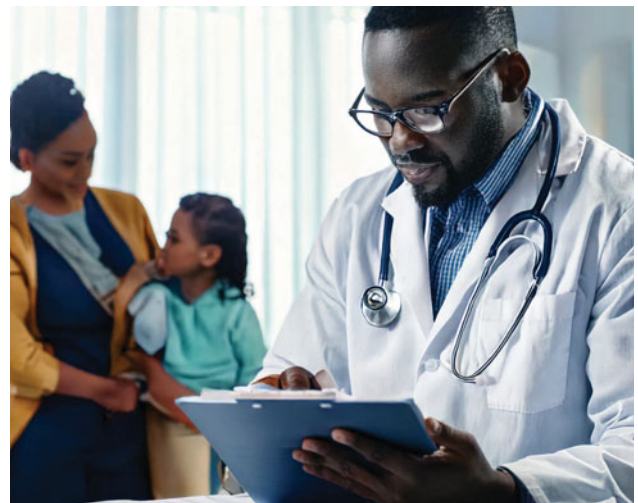
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Abstract

Background: Pediatric respiratory diseases, including asthma, are the leading causes of urgent care (UC) center and emergency department (ED) visits and hospitalizations among children in the United States and globally. Asthma care in the pediatric UC setting has not been well-studied. It is known, however, that many children presenting to primary care clinics and EDs with acute asthma exacerbations receive unnecessary chest x-rays (CXR). Multiple professional societies and organizations have made formal recommendations against the use of CXR in this setting.

Objective: The aim of this project was to increase clinician use of an evidence-based order set in pediatric asthma presentations in pediatric UC centers through various interventions and to track average length of stay (LOS) and CXR use after order set implementation.



Methods: This quality improvement project involved a 1-month educational and pilot phase for nurses, advanced practice providers (APPs), and physicians prior to the “go live” date. During this phase, clinicians were informed about the new order set and asthma pathway and were allowed to provide feedback for improvements. The final order set and pathway were then integrated into the electronic medical record (EMR) system.

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Subsequently, a survey was sent to 79 clinicians to evaluate for awareness of, utilization of, and preferences for educational modalities. Utilization rates and self-reported feedback were measured over a 12-month period.

Results: Clinicians' report of their personal use of the evidence-based order set was incongruent with data extracted from the EMR. We provided actual utilization data to the clinicians regarding their usage of the order set, focusing efforts towards clinicians with low adherence rates. During the 12-month project period, the use of the asthma order sets by clinicians increased. However, the increased order set usage did not correlate with changes in the LOS for children with acute asthma exacerbations or a change in the rate of CXR utilization.

Conclusion: In this pilot project, we found that clinicians' use of evidence-based order sets increased during the project period. The educational interventions may have contributed to this change, however, future prospective randomized controlled trials would be helpful in determining causality.

Introduction

Pediatric respiratory presentations, including asthma, are the leading cause of UC and ED visits, as well as hospitalizations in children; as such, respiratory presentations in children are a significant source of morbidity and mortality globally.¹⁻¹¹ In the United States, asthma remains the most common chronic respiratory disease of childhood, affecting approximately 8% of children.^{12,13}

The management of asthma in the pediatric UC setting is not well-studied, and most published data comes from emergency and inpatient settings. ED-based studies on this topic have shown that clinician adoption of evidence-based care for asthma in children remains suboptimal despite recent progress in our understanding of best practices for appropriate resource utilization.^{2,5,14} Evidence-based clinical decision support tools, guidelines, and pathways define the universal standards for effective asthma management.¹⁵ Prior quality programs that simplify these guidelines and integrate clinical decision support tools within the EMR have been shown to improve the quality of asthma care in outpatient settings.^{15,16} The National Asthma Education and Prevention Program guideline for the management of acute asthma exacerbations advises against the use CXR for the routine assessment of children with acute asthma exacerbations.^{17,18} Current guidelines recommend limiting the use of CXR in patients presenting with acute

asthma exacerbations to <20%.¹ However, many pediatric patients presenting to outpatient settings with acute asthma exacerbations still undergo CXR despite these guidelines. CXR usage in patients presenting with acute asthma exacerbations is among the lowest value services (ie, wasteful use of health services with limited benefit as compared with harm) offered in pediatric ED settings.¹⁹ The use of decision support tools, standardized order sets, feedback, and audit have shown promise for improving clinicians' adherence to asthma guidelines.²⁰

Published data on respiratory illness from pediatric UC visits are very limited. The Pediatric Hospital Information System (PHIS) has created an administrative database containing inpatient, ED, and ambulatory observational data from 41 not-for-profit, tertiary care pediatric hospitals in the United States.²¹ However, the PHIS database currently does not include data from UC centers. As such, there remains an absence of data on pediatric asthma care in UC centers, despite increasing trends of UC utilization in children.^{22,23}

Methods

The specific clinical pathway and order set for pediatric asthma presentations used in the project were created collaboratively by the clinical effectiveness program (CEP) within a large pediatric academic hospital in Florida and implemented in the hospital's 10 affiliated UC centers. The CEP consists of a multi-disciplinary team comprised of APPs, physicians, and nurses from multiple departments including primary care, UC, emergency medicine, pulmonology, inpatient care, pharmacy, and medical informatics. The aim of the CEP is to standardize and improve patient care and outcomes. The evidence-based medicine committee of the hospital reviewed and approved the clinical pathway and order sets prior to their implementation. The project was exempt from institutional review board review as it did not meet criteria for human subjects research.

A 1-month educational pilot period, which involved emails informing clinicians about the availability of the order set and pathway, was implemented prior to the project initiation ("go live") date. During the pilot phase, feedback was solicited and aggregated from clinicians/users on how to improve the pathway and order sets. The final pathway and order set were then published on the "go live" date and accessible through the EMR in April 2020.

An initial survey was sent to 79 clinicians (physicians and APPs) to assess their awareness of evidence-based guidelines, self-reported resource utilization frequency, and preferred modalities for education, as well as to

Figure 1. Asthma Order Set Usage Among All Centers and Clinicians				
Order Set (OS) Usage	June 2022 Baseline	December 2022 6 Months	June 2023 12 Months	
				p-value
OS Usage (n, %)	110 (38.06%)	294 (65.48%)	184 (84.02%)	0.001
Non-OS Usage (n, %)	179 (61.94%)	155 (34.52%)	35 (15.98%)	
Acute Asthma Encounters	289 (100%)	449 (100%)	219 (100%)	

A chi-square test was conducted to examine the difference in order set usage over time. The result indicated statistically significant differences over time, $\chi^2(2)=116.88$, $p=0.001$.

Figure 2. Average Length of Stay (LOS) For All Patients Diagnosed With Acute Asthma Exacerbation			
	Baseline (n=289)	12 Months (n=219)	p-value*
LOS, mean (SD)	1.90 (0.41)	1.72 (0.41)	0.001

*An independent samples t-test was conducted to examine LOS between start and end of the observation period. The results indicated that there was a statistically significant decline in LOS between start (M=1.90, SD=0.41) and end of observation (M=1.72, SD=0.41), $t(506)=4.90$, $p=0.001$.

Figure 3. CXR Usage for All Patients with Acute Asthma Exacerbations				
	Baseline	6 Months	12 Months	p-value*
Count (yes, n %)	71 (24.65%)	94 (21.17%)	54 (25.47%)	0.371
Count (no, n %)	217 (75.35%)	350 (78.83%)	158 (74.53%)	

A chi-square test was conducted to examine the difference in proportions over time. The result indicated no statistically significant differences over time, $\chi^2(2)=1.98$, $p=0.371$.

gather feedback about existing clinical pathways and order sets. Clinicians' utilization of the asthma order set was measured for all patients with a discharge diagnosis of "acute asthma exacerbation." Data was collected over a consecutive 12-month period beginning in June 2022. The CEP team set a target of 80% for asthma order set usage in the UCCs. We also measured clinician awareness and self-reported utilization of the asthma order set among clinicians at the end of the 12-month period with a second survey.

The outcome measures compared to baseline/pre-project values were:

1. Change in use of the asthma clinical pathway and order set after implementation
2. Change in the average LOS for patients presenting to the pediatric UC centers with acute asthma exacerbations after implementation of guideline-based clinical pathway
3. Change in the proportion of patients diagnosed with acute asthma exacerbations that underwent CXR

Description of Quality Interventions

Beginning in September 2022, the hospital data science

team began reporting monthly metrics on the usage of the asthma order set in the UC, ED, and inpatient units. The data science team reports included all patients in these settings with a discharge diagnosis of "acute asthma exacerbation." The reports identified how often the treating clinician had used the asthma order set. All UC clinicians were sent a monthly report of their use of asthma order sets. Each month, clinicians who had low (<50%) pathway usage were provided individualized "report cards," direct (one-on-one) education and feedback for improvement, and then were given an opportunity to discuss any barriers contributing to their low rate of usage. Usage data and reminders about the importance of using the order sets and pathway were also presented at quarterly UC staff meetings.

Results

The initial survey was sent to all the organization's UC clinicians (47 physicians and 32 APPs). The response rate to the survey, which was sent at the beginning of the project period, was 48% (n=38/79). All (100%) respondents reported using the general pathway at least once. Additionally, 76.3% (n=29/38) of respondents reported having knowledge regarding the availability of

the evidence-based order sets, and self-reported pathway and order set usage was 100% (n=38/38).

The survey was repeated after the outlined quality interventions. The response rate for the follow-up survey was 40.5% (n=32/79). In the follow-up survey, 100% of respondents again reported personal use of the pathway at least once (n=32/32). Interestingly, only 90.6% of respondents reported knowledge of the pathway (n=29/32).

During the 12-month observation period, a total of 258,112 pediatric patient encounters occurred among the 10 UC centers. Of those encounters in children, 5,034 (2%) had a discharge diagnosis of acute asthma exacerbation.

As shown in **Figure 1**, asthma order set usage significantly increased during the project period from 38.06% at the beginning of the observation period to 84.02% (χ^2 p=0.001).

As shown in **Figure 2**, the average LOS for patients seen in UC for acute asthma exacerbations decreased a small but statistically significant amount during the project period, from 1.90 hours initially to 1.72 hours after 12-months (p=0.001).

The proportion of patients with acute asthma exacerbations who had CXRs was 24.65% initially, 21.17% after 6 months, and 25.47% after 12-months, which was not a significant change (p=0.371) (**Figure 3**).

Discussion

The PHIS database does not include data from UC centers, and institutions with a large pediatric UC footprint do not report to or have access to national UC data.²¹ There were roughly 200,000 unique pediatric (0-21 year olds) encounters at our institution during our study period. During the 12-month study period, about 2% of these encounters were for acute asthma exacerbations, amounting to approximately 5,000 encounters across 10 UC centers. Thus, many patients and families are affected by how children with acute asthma exacerbations are managed in our centers.

While many studies have assessed the frequency of ED visits related to asthma exacerbations in children, only 1 study has assessed the proportion of UC visits that constitute care for asthma in children. This single study found 9% of visits in children from 2009-2015 presenting to UC were related to asthma, but this study was restricted to metropolitan Washington, D.C., and included only military healthcare facilities.²⁴ Ours is the first publication assessing the frequency of pediatric asthma exacerbations in civilian pediatric-specific UC centers.

To our knowledge, this pilot quality improvement project is the first of its kind to follow changes in clinician EMR engagement, test ordering, and LOS after implementation of evidence-based clinical guidelines in the EMR for the care of acute asthma exacerbations among children presenting to a UC setting. We monitored for changes in these variables while targeting educational interventions towards clinicians with the lowest use rates individually as well as across the whole group broadly.

There were several findings of interest in this pilot quality improvement project. First, clinicians over-reported their use of the asthma pathways. While clinicians often stated they were aware of the order sets and guidelines and were using them regularly, the data of their actual usage revealed much lower levels of clinician engagement with the tools. Additionally, as we continued the announcements and focused clinician educational interventions, we saw a relatively substantial increase in clinician use of the asthma order set (38% to 84%) during the 12-month project period. This may be related to the interventions, but causality cannot be ascertained with the project's design (ie, absence of a control group).

The use of decision support tools or order sets, feedback, and audit have been shown to help improve clinicians' adherence to asthma guidelines.^{15,16} In this study, we predicted order set use would correlate with reducing CXR use in children with acute asthma exacerbations. While the EMR was engineered to provide a pop-up on-screen notice stating CXR is "*not routinely recommended as per Choose Wisely Campaign*," we were not able to access monthly data on CXR ordering as we were with order set utilization. Therefore, we were not able to provide feedback to clinicians on their use of CXR. Given that feedback was provided to clinicians about order set utilization with increased order set utilization observed (and feedback was not provided regarding CXR utilization with no change observed in CXR ordering), it is possible that the feedback contributed to increasing levels of clinician engagement with the asthma order set. Unfortunately, given that this quality project had no control group, such inferences cannot be made from the data. For example, it is possible that rather than a specific aspect of the interventions contributing to clinician behavioral change, the awareness of being monitored in the order set usage drove this effect (ie, the Hawthorne effect). Future work exploring these practices with formal study, such as a prospective cluster randomized trial, would offer more insights as to the effect of the specific interventions.

We hypothesized clinicians who used the asthma order set would have shorter average LOS for their patients. We did observe that average LOS was reduced by an average of 10.8 minutes during the observation period, which was statistically significant. We restricted the LOS assessment to only patients who presented with acute asthma exacerbations, which accounted for approximately 2% of all patient visits during the project period. LOS is also affected by countless factors including, but not limited to, the time of day, day of the week, and the number of other patients being cared for concurrently. Since LOS is a common metric for tracking efficiency, further work on the topic of standardizing care for pediatric asthma in UC and its effect on overall UC efficiency should explore how implementing such care guidelines for asthma affect not only the LOS of patients with asthma but overall LOS for all patients in a prospective randomized controlled fashion.

Limitations

This was a small pilot project. Given the lack of control groups, inference regarding causality of any observed changes in clinician practices and LOS are necessarily speculative. The response rate was 48% on the initial survey and 40.5% on the follow-up survey; since the majority of clinicians did not respond, it is possible the non-responding group may have been systematically different than those who did respond in one or more ways.

Cases included were determined by the International Classification of Diseases code (ICD-10) of “acute asthma exacerbation” diagnosis assigned at discharge. It is likely that some children with asthma exacerbations were given alternate discharge diagnoses (eg, viral upper respiratory infection, bronchitis, etc.) and therefore would not have been included in the analysis.

Understanding the myriad influences on clinician behaviors is a complex topic. Given very limited scholarly work on these topics in UC settings, this pilot project, while limited in size and scope, does offer several insights as to worthwhile directions for future research. Our data confirm that asthma exacerbations are relatively common in pediatric UC centers. Appropriate care for pediatric asthma has among highest levels of supportive evidence, which makes this topic ideal for further research in UC centers to determine how to ensure clinicians are delivering high-quality, evidence-based care. ■

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