

Implementing a Standardized Clinical Pathway Leads to Reduced Asthma Admissions and Health Care Costs

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Introduction: Asthma exacerbations are 1 of the leading causes of hospital admissions in children in the United States. High volumes in the emergency department can lead to delayed treatment. Several studies have shown that implementation of a standardized clinical pathway can improve adherence to evidence-based standards. The purpose of our quality improvement project was to develop a standardized pathway of care for children with asthma exacerbations to improve time to treatment and reduce admissions.

Methods: The team used process mapping to review the current process of care for patients with asthma exacerbations presenting to the Emergency Department. After identification of several barriers, the team used plan-do-study-act cycles to develop a standardized clinical pathway of care for children based on their respiratory clinical score. Further interventions occurred after data collection and analysis through run charts. **Results:** Implementation of a standardized clinical pathway for children with asthma presenting to the Emergency Department resulted in treatment with steroids in less than 60 minutes. Overall admissions were decreased from an average of 24% to 17% throughout the intervention period. We estimated cost savings for the institution at over \$230,000 for the 2 years after implementation of the pathway. **Conclusions:** Using a multidisciplinary team approach to develop a standardized clinical pathway for a common childhood illness like asthma can result in reduced time to treatment and admissions. (*Pediatr Qual Saf* 2018;3:e091; doi: 10.1097/pq9.000000000000091; Published online June 26, 2018.)

INTRODUCTION

Asthma is 1 of the leading causes of hospital visits in children and therefore a significant health care cost burden.¹⁻³ In an emergency department (ED), time to evaluation and treatment is critical; for children with an acute asthma exacerbation, this delay can lead to poor outcomes and unnecessary



admissions. Despite specific clinical practice guidelines for the diagnosis and management of asthma, variation exists among providers with regard to the treatment of asthma. This variation leads to inconsistent outcomes and costs.⁴ Several studies have demonstrated that implementing a standardized ED clinical pathway leads to improved adherence to evidence-based treatment guidelines for asthma and results in a reduced rate of hospital admissions.⁵⁻⁷ Furthermore, early treatment with systemic steroids leads to improved flow in the ED and reduction in hospital admissions for children with acute asthma exacerbation.⁸⁻¹⁰

The Institute for Healthcare Improvement's Model for Improvement has been used in a variety of clinical settings to lead to changes in practice and focus on improving adherence to evidence-based practice guidelines.^{11,12} Our team sought to standardize care provided to patients presenting to the ED with acute asthma exacerbation through the development of a clinical pathway to improve time to systemic corticosteroids to less than 60 minutes and ultimately reduce asthma admissions by 5%.

METHODS

Context

Le Bonheur Children's Hospital is a 255-bed tertiary free-standing children's hospital in Memphis, Tenn., with an average ED volume of 90,000 patients per year. Of those, about 3,000 present with acute asthma exacerbations, and

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an average of 23% are admitted to the hospital. Patients presenting to our ED are evaluated and treated by pediatric-specific providers including general pediatricians, fellowship-trained pediatric emergency medicine specialists, and trainees, such as fellows and residents.

Intervention

Our team consisted of pediatric ED physicians, hospitalists, pharmacists, an outpatient physician, nurses (inpatient and ED), respiratory therapists, information technology specialists, and pediatric chief residents. The team initially met weekly then biweekly over a period of 3 months; meeting frequency was gradually decreased as the project proceeded. The team began by creating a process map for a child’s progression from arrival to the ED to a decision to either discharge the patient home or admit the patient (Supplemental Figure 1, available at <http://links.lww.com/PQ9/A30>). This exercise allowed the team to identify barriers to care to plan our intervention.

One of the first barriers identified was the respiratory severity assessment tool currently in use, which failed to convey the severity of the child’s respiratory status accurately. After review of the literature, the team adopted a new, more transparent, and reproducible respiratory score for our institution, the Respiratory Clinical Score (RCS).¹³ Utilizing the RCS, the team created an evidence-based

clinical pathway driven by the score obtained upon arrival in triage (Supplemental Figure 2, available at <http://links.lww.com/PQ9/A31>). Based on the level of severity (mild, moderate, or severe), an ED nurse or respiratory therapist could assess and initiate treatment within the first few minutes of a child’s arrival. Ease of provider use of the pathway was another barrier considered by the team. To address this, we also developed a computerized order entry plan to be used in parallel with the clinical pathway.

The team also identified the need to educate a large and varied clinical staff as a potential barrier to successful implementation of the new RCS and clinical pathway. We used a multipronged approach to provide effective education to all care providers. Members of the team were responsible for educating their respective colleagues, that is, physicians, nurses, residents, pharmacists, and respiratory therapists. Educational methods included lectures, online training, presentations at staff meetings, one-on-one training, pocket-sized pathways, and “badge buddies” for all care providers. Additionally, team members were provided monthly run charts to distribute to their clinical areas, facilitating staff awareness, and feedback on the project’s progress.

Data Collection and Analysis

Data were extracted from the electronic medical record of patients ages 2–18 years old admitted with a primary

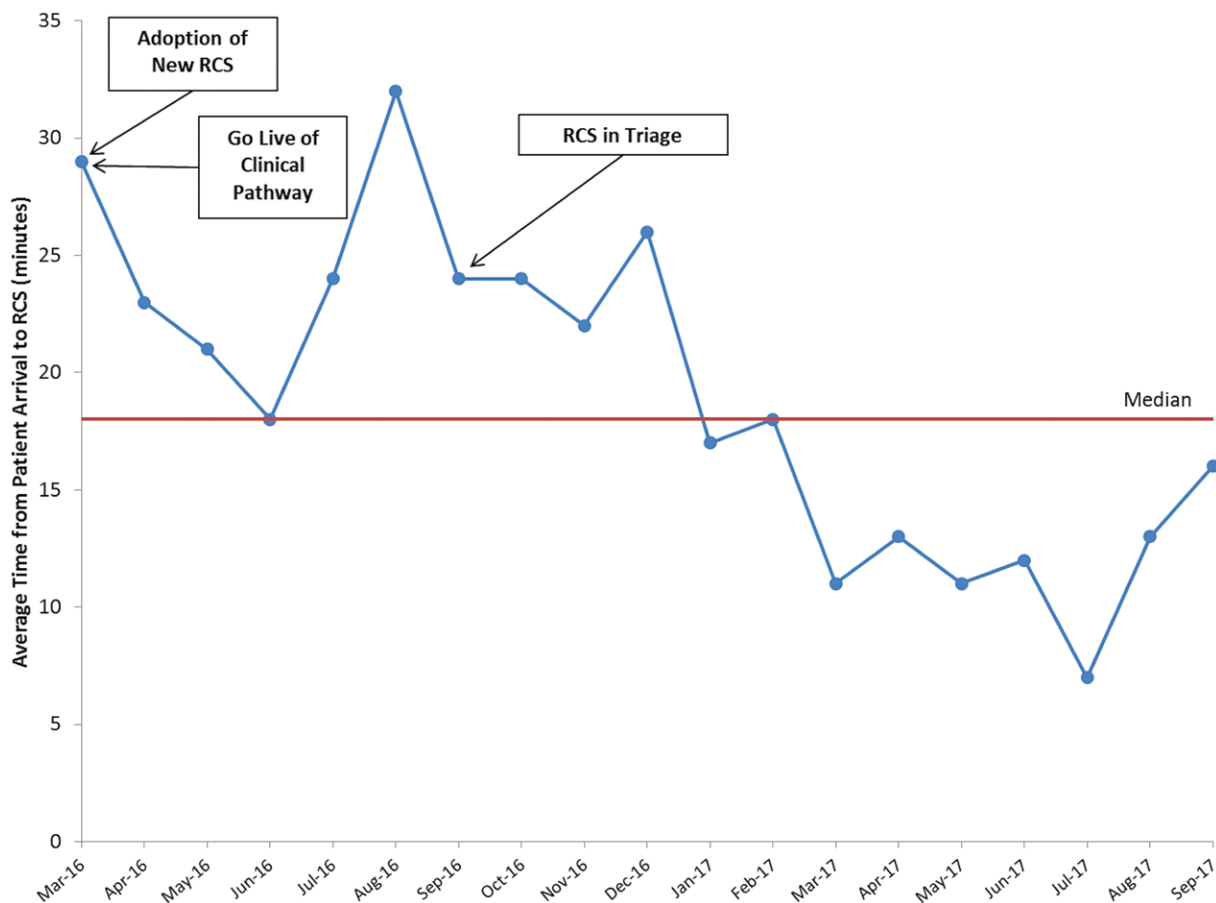


Fig. 1. Run chart showing time to Respiratory Clinical Score.

diagnosis of asthma exacerbation (ICD-9 code 493 with all included subsets and ICD-10 code J45 with all included subsets) beginning in January 2015. The team selected several measures to monitor throughout the initiation of our interventions including asthma patient volumes, admission rates, 72-hour return rates, use of the computerized order entry system, average time from arrival to steroids, and average time from arrival to first albuterol treatments. These data were plotted on run charts, then evaluated for signals indicating special cause variation.^{14,15} The team used the analysis to identify deficits in management and develop solutions to those problems. The costs reported reflect direct patient care costs associated with each encounter. We calculated the cost reduction by applying a direct cost per day from year 1 for asthma encounters to encounters in subsequent years. Direct cost per day is based on direct patient care related salary and the cost associated with caring for this population.

The University of Tennessee Health Science Center Institutional Review Board approved this quality improvement project.

RESULTS

In the Le Bonheur ED, compliance with use of the standardized clinical pathway and computerized order entry plan went from less than 20% to 90%. Providers readily adopted the clinical pathway as evidenced by the marked

increase in provider use of the pathway and order entry set during March of 2016. By incorporating the RCS into the triage process, children with an asthma exacerbation received an RCS in less than 20 minutes, and subsequently received evidence-based treatment more rapidly (Fig. 1). In particular, the time from arrival to administration of the first steroid dose decreased to less than 60 minutes (Fig. 2). Overall, the introduction of this standardized clinical pathway to treat asthma resulted in children receiving treatments sooner through the use of an RCS. This intervention ultimately improved time to steroids and reduced overall admissions from an average of 24% to 17% over a year (Fig. 3). The reduction in admissions and associated patient days corresponds to an approximated cost savings of over \$230,000 for the 2 subsequent years following introduction of the pathway (Supplemental Figure 3, available at <http://links.lww.com/PQ9/A32>). As balancing measures, the team monitored the average ED length of stay before and after implementation of the clinical pathway and the rate of returns within 72 hours, neither of which significantly increased.

DISCUSSION

We found that using a multidisciplinary team approach to develop a standardized clinical pathway for commonly encountered pediatric illnesses can result in reduced time

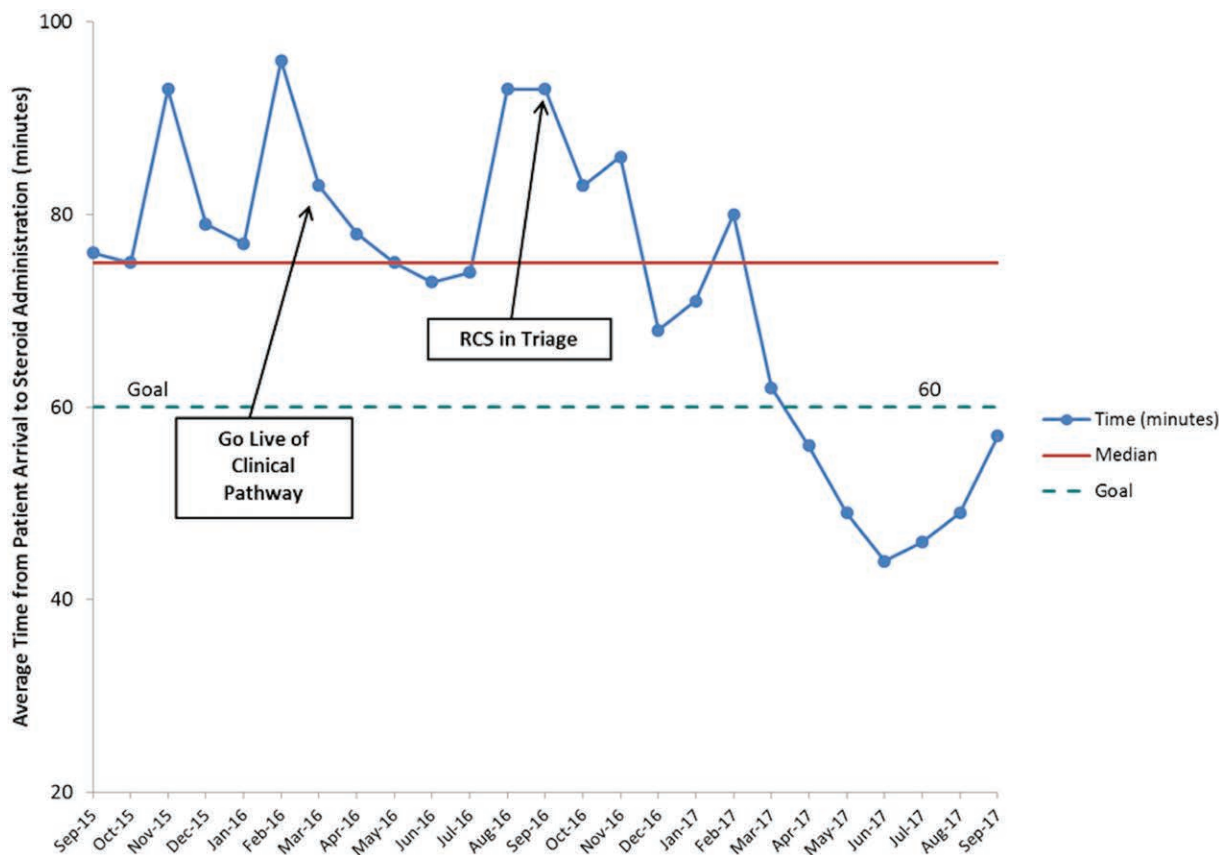


Fig. 2. Run chart showing improvement of the average time to steroid administration.

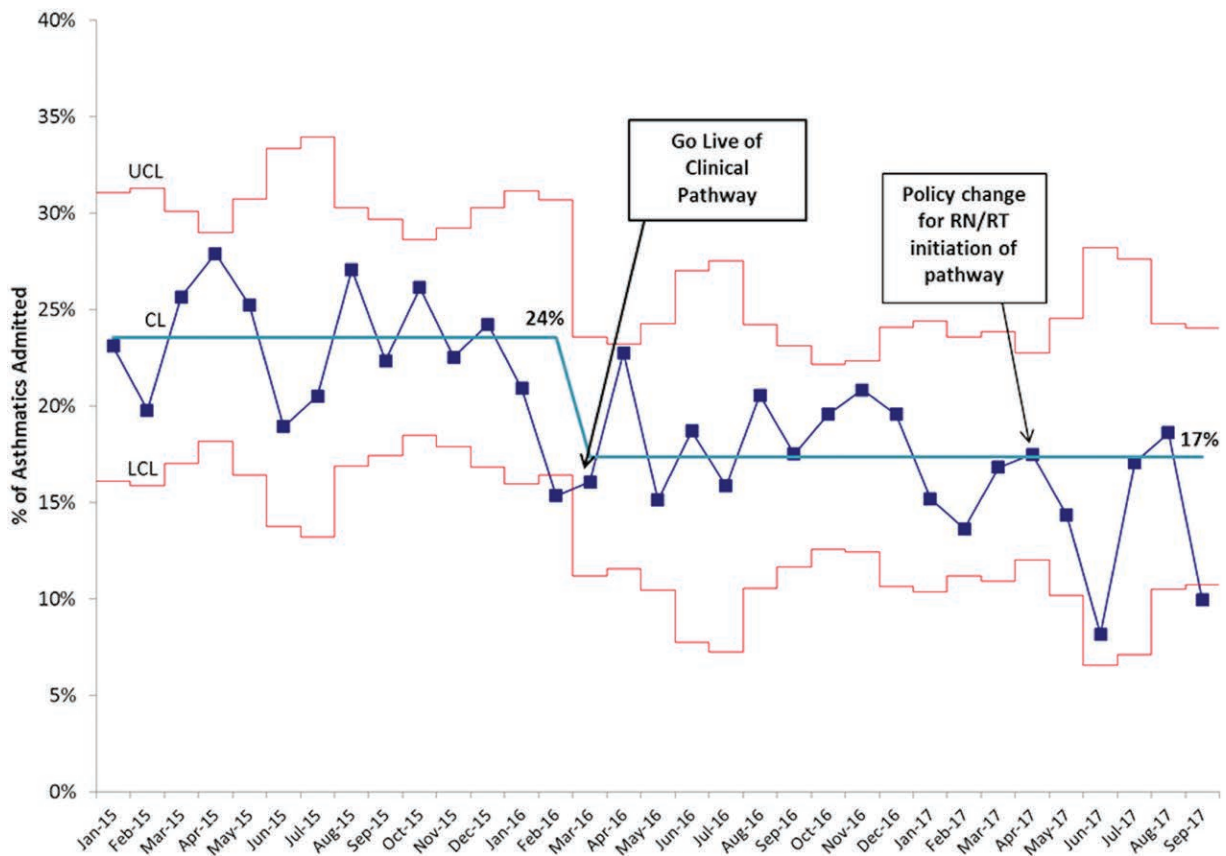


Fig. 3. P-chart showing decrease in percent of admissions after implementation of the standardized clinical pathway.

to treatment and ultimately reduced hospital admissions. By including all involved care providers in the creation and implementation of the asthma clinical pathway, we achieved system-wide buy-in to the pathway. This success allowed us to collaboratively adapt our pathway through Plan-Do-Study-Act cycles, and thereby achieve more significant results.

The reduction in admissions was evident soon after implementing the standardized clinical pathway, as the RCS determined the level of treatment a patient received, that is, all patients with an RCS in the severe category received intravenous magnesium. Following the pathway resulted in less clinician variability. As data analysis continued, the team noticed a delay in RCS and subsequent treatment around August 2016. This delay corresponded to a seasonal peak in asthma and doubling of patient volumes. In response, the next Plan-Do-Study-Act involved addition of the RCS to the triage process allowing nurses and respiratory therapists to promptly treat these patients. This led to a precipitous drop in those times.

Before April 2017, physicians were solely responsible for entering all patient orders, thus delaying patient flow. After discussions with hospital administration, our policy changed to allow nurses and respiratory therapists to initiate the computerized order entry set to administer steroids and albuterol nebulizers based on the triage RCS. This policy change allowed evidence-based metrics, such

as the time to first steroid dose and percent of admissions, to steadily improve, as compliance with the pathway increased.

Our findings are similar to other studies that have shown improved compliance to evidence-based guidelines and reduction in admissions by implementing a standardized clinical pathway.⁵⁻⁸ The success of this project had far reaching effects with regard to people and health systems. It allowed ED, inpatient, and outpatient providers to work together to produce a streamlined process from a patient's arrival to the ED with an asthma exacerbation to the point of decision for discharge or admission. At our hospital, we use this approach to other common childhood illnesses, such as bronchiolitis. Moreover, our hospital system recognized the results achieved through our efforts and is considering expansion of the clinical pathway to adult facilities within our hospital system that treat children in the ED.

There are limitations to our quality improvement efforts including potential lack of generalizability. It is critical to the project's success that our hospital system allows for the use of nurse and respiratory therapist-initiated pathways, such as the 1 created for asthma described here. This capability is advantageous in that it allows for children with a specific RCS to begin treatment before physician evaluation. However, it is possible that it may not be feasible for other institutions

to incorporate a similar system. Another limitation includes our lack of baseline data for time to respiratory score. The previously used respiratory score was not given until a child was placed in a room; therefore, we assumed a longer time to respiratory score before the adoption of the RCS. An additional limitation is that we have extremely high volumes of asthma patients, which allowed for considerable cost savings by reducing admissions. Other institutions may not obtain similar savings. It is also prudent to note that from 2015 to 2017, our hospital saw a decrease in number of asthma encounters by approximately 1,000 patients. This likely contributed to a portion of the cost savings. Despite this, we reduced the overall percentage of admissions and achieved significant savings.

It is clear that standardized clinical pathways for common pediatric diseases, like asthma, are effective in providing early, cost-effective care. For our institution, this clinical pathway proved to be most successful due to it being a nurse and respiratory therapist-initiated process. Our results have proven to be sustainable throughout the past year. Due to the computerized order entry plan that prompts the next step in the clinical pathway, it should continue to maintain its effectiveness. We plan to spread this clinical pathway to other hospitals within our system and to use this approach on other pediatric illnesses to further standardize evidence-based clinical care.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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