

Emergency Department Asthma Medication Delivery Program: An Initiative to Provide Discharge Prescriptions and Education

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Abstract

Background: Prescription fill rates for children being discharged from the emergency department (ED) after asthma exacerbations are low, placing the child at risk for additional ED visits or admissions for asthma. This article describes the implementation of an ED asthma prescription delivery service designed to improve pharmacy prescription capture and decrease ED revisit rates. **Methods:** A core group developed a service to provide asthma prescriptions and education to patients in their ED room before discharge. The project assessed the percent of ED asthma patients who filled ED asthma prescriptions at the hospital outpatient pharmacy, 7-, 14-, and 30-day ED revisit rates, and patient satisfaction. **Intervention:** Patients/families who chose to participate in the service received asthma prescriptions and education at the ED bedside. Within 1–3 days, ED outreach nurses obtained patient satisfaction survey responses via telephone. **Results:** There was a statistically significant increase in the number of patients who filled ED asthma prescriptions at the hospital outpatient pharmacy (22.2% versus 33.8%; $P < 0.0001$). The decrease in 7-, 14-, or 30-day ED revisit rates for patients who received the medication delivery service compared with standard of care was not statistically significant. Patients were satisfied to very satisfied with the service. **Conclusion:** Postimplementation of a medication delivery program within the ED, there was an increase in the percentage of patients who filled ED asthma medication prescriptions at the hospital outpatient pharmacy. There was no difference in ED revisit rates for patients who enrolled in the prescription delivery service versus standard of care. (*Pediatr Qual Saf* 2017;2:e033; doi: 10.1097/pq9.000000000000033; Published online June 16, 2017.)

INTRODUCTION

Problem Description

Asthma is one of the most common chronic diseases in children, affecting close to 10% of children in the United States. In 2010, asthma attributed to approximately 440,000 hospitalizations and 2 million emergency department (ED) visits.¹ Only 24–35% of asthma patients are controlled, defined as having normal pulmonary function, no symptoms, no exacerbations, and no limitations of day-to-day activity. Nonadherence and misunderstanding of medications, low health literacy, improper inhaler technique, and inadequate health-care access have been shown to contribute to poor asthma control, leading to preventable ED visits/hospitalizations and increased health-care costs.^{2–6}

Available Knowledge

Prescription fill rates for patients discharged from EDs range between 44% and 92%.^{6–11} These data represent patient survey responses, which may only be 60–70% accurate.^{2,11} According to insurance data, 65% of children's high-urgency medication prescriptions are filled after ED visits.¹¹ Cooper and Hickson found that only 44% of Medicaid-insured children picked up an oral corticosteroid following an ED visit or hospitalization for an asthma exacerbation.¹²

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Pharmacist interventions improve asthma control, asthma control questionnaire scores, medication adherence, and inhaler technique in patients on controller asthma medications.⁵ Pharmacy-led discharge delivery programs increase adherence, improve patient satisfaction, and lower readmission rates in other disease states.^{8,13-15} In a study by Ginde et al.,⁸ patients who received ED antibiotic prescription delivery had 100% first fill compliance compared with those given a prescription to be filled free of charge at a 24-hour pharmacy located close to the ED (74% first fill compliance).¹³

A study at a pediatric hospital outpatient pharmacy confirmed that children presenting to the ED or admitted with asthma exacerbations who filled discharge medications at the hospital outpatient pharmacy had statistically significantly lower 30-day readmission rates when compared with nonhospital outpatient pharmacy users (2.3–10.9%; $P < 0.001$). The study also found that patients who were less than 4 years, were seen in the ED, had Medicaid as primary insurance, and did not fill at the hospital outpatient pharmacy had the highest readmission rates.¹⁶ There is a lack of research on asthma prescription delivery programs to EDs.

Rationale

Since a previous study demonstrated higher readmission rates among patients discharged from the ED who did not fill asthma medications at the hospital, this study sought to determine if a pharmacy-led ED discharge delivery service would improve ED revisit rates.

Specific Aims

The program was developed to determine if the initiation of an asthma prescription delivery service to the ED would increase the percentage of patients discharged from the ED with a primary diagnosis of asthma that filled related medications at the hospital outpatient pharmacy and decrease ED revisit rates. Over the course of developing the ED medication delivery service, multiple Plan Do Study Act (PDSA) cycles were completed and evaluated to determine program efficacy and impact on both outpatient pharmacy utilization and patient outcomes. One means of program evaluation was the use of surveys administered to patients and their families. We collected pharmacy fill rate data from January 2013 to November 2015. We also obtained additional data about medication delivery from November 2014 to February 2015 to determine if those patients receiving medication deliveries were significantly different in terms of patient demographics or ED utilization rates.

METHODS

Context

Nationwide Children's is a free-standing pediatric hospital with a Level I Pediatric Trauma Center and Pediatric ED located in Columbus, Ohio. One of 2 hospital outpatient

pharmacies is located adjacent to the ED. From October 2013 to October 2014, the ED saw an estimated 248 patients per day and approximately 15 asthma patients per day. However, before the initiation of a more formalized medication delivery program, only 22.2% of patients filled ED asthma medications through the outpatient hospital pharmacy.

Intervention

A core group consisting of an emergency medicine physician, quality improvement service manager, ED clinical lead nurse, ambulatory pharmacist, ED staff nurses, licensed practical nurse/patient liaison, and a pharmacy resident developed a feasible workflow (Fig. 1). The group completed multiple small PDSA cycles and evaluated patient satisfaction survey answers to improve the processes during this study.

The pharmacy team, consisting of student pharmacists and outpatient pharmacist preceptors, were educated on how to provide the medication delivery service via standardized training. Student pharmacist education consisted of pediatric drug information, cultural competency, project workflow, asthma disease state and medication counseling, and electronic medical record training. Pharmacists received project information and electronic medical record training. ED nurses and medical residents received project training during weekly meetings, whereas ED attending physicians were trained one-on-one during their shifts. The core group placed various marketing materials throughout the ED as well to promote utilization of the medication delivery program.

Communication between the ED and the pharmacy department occurred via medical electronic communication devices and telephone. ED and pharmacy staff also voiced recommendations for improvement to core team members who met weekly to discuss and implement changes.

The prescription delivery service began on November 11, 2014, with data collection starting on January 1, 2013, to ensure an adequate amount of baseline data before program initiation. Any child between 2 and 18 years of age who presented to the ED with a primary diagnosis of asthma and received prescriptions from the ED for asthma during the hours the hospital pharmacy was open (9:00 AM to 11:00 PM Monday to Friday) was eligible for medication delivery. Interpreter services were available for non-English-speaking patients. Patients/families that met inclusion criteria for the prescription delivery service were asked by the nurse or provider if they would like their asthma medication prescriptions (one or all medications prescribed) delivered from the pharmacy to the ED bedside. If the patient agreed, the ED would then contact the hospital outpatient pharmacy to make them aware of patient participation. Once patient discharge was decided, prescriptions were sent to and filled as a priority at the hospital outpatient pharmacy. A pharmacy

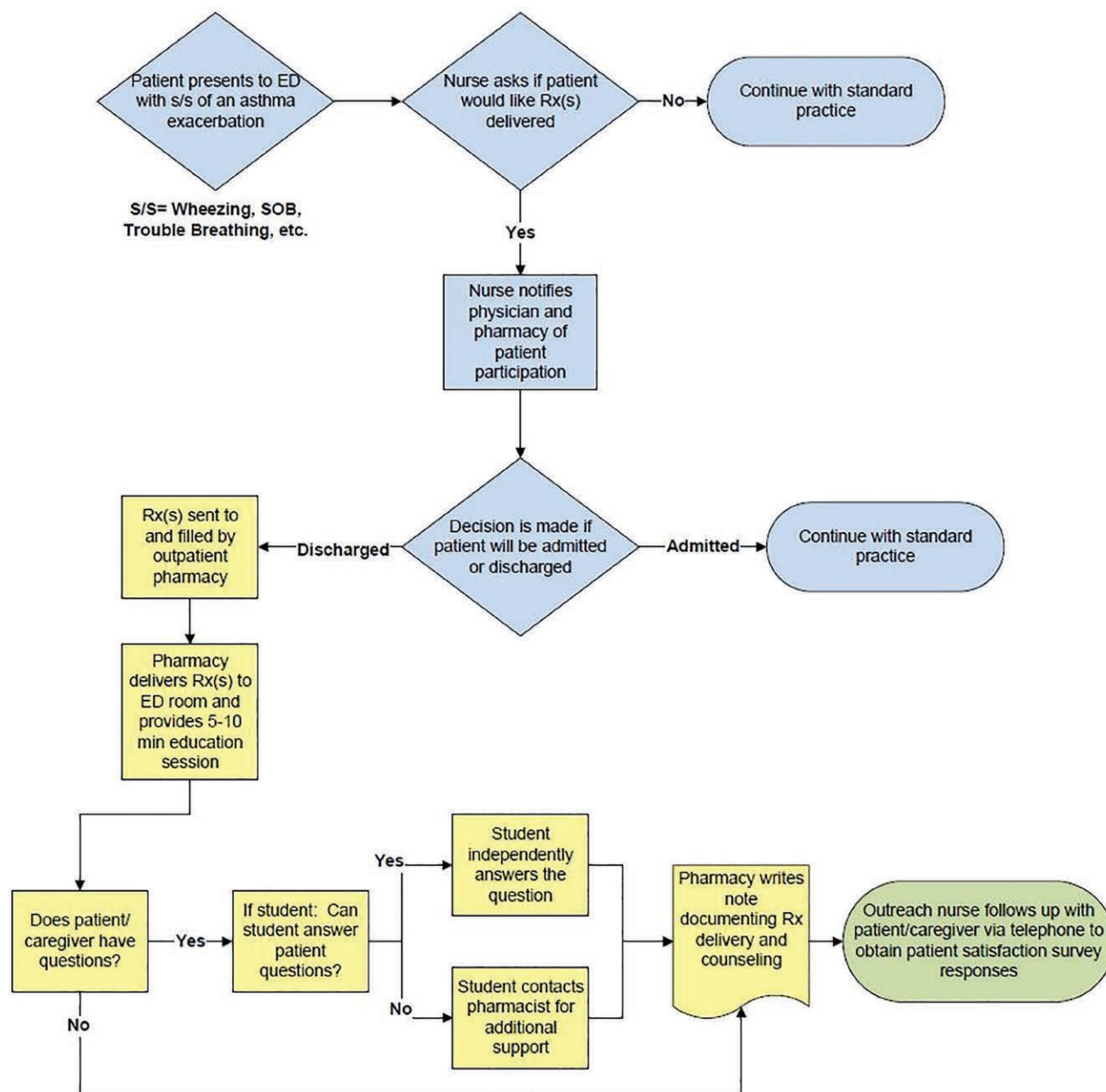


Fig. 1. Nationwide Children's Hospital (NCH) Emergency Department (ED) asthma prescription (Rx) delivery program workflow.

staff member then delivered medications to the bedside, shared verbal and written education, provided supplies, and obtained payment as well as signatures for the prescription(s). The pharmacy staff member then placed a note in the patient's electronic medical record detailing the service provided. Within 1–3 days of discharge and participation in the prescription delivery service, ED outreach nurses followed up with the patient/caregiver via telephone to obtain patient satisfaction survey responses for quality improvement purposes.

Study of the Intervention and Measures

Ultimately, this project augmented ongoing quality improvement initiatives within the hospital to improve overall asthma control. The quality improvement (QI) team

monitored two outcome measures of interest to assess the program's impact on ED asthma patients and their overall asthma control. The primary outcome measure evaluated the percentage of patients who filled ED asthma prescriptions at the hospital outpatient pharmacy following the establishment of a formalized asthma medication delivery program. The percentage of patients filling asthma prescriptions upon discharge from the ED before and after implementation of the delivery program reflects the volume of patients leaving the hospital with medications in hand.

To assess the percentage of patients who filled ED asthma prescriptions at the hospital outpatient pharmacy, we reconciled the patients' electronic medical records with the hospital outpatient pharmacy records. Before implementation of the prescription delivery program, an

average of 22.2% of asthma patients discharged from the ED with prescriptions during pharmacy hours utilized the hospital outpatient pharmacy. Based on a previous study that demonstrated decreased 30-day readmission rates when patients filled asthma medications at the hospital outpatient pharmacy, the team aimed to increase hospital outpatient pharmacy utilization from a previous goal of 30%, to 40% among the ED population.¹⁶

The secondary outcome measure followed ED revisit rates 7, 14, and 30 days following treatment for asthma in the ED based on patient enrollment in the delivery service versus standard of care. To ascertain the impact of medication delivery secondary to filling prescriptions at the outpatient pharmacy, a PDSA was instituted from November 10, 2014, to February 10, 2015, to determine program influence over the first 4 months of implementation. Each patient was followed to determine if they returned to the ED with a primary diagnosis of asthma within the identified timeframes. From October 2013 to October 2014, hospital ED asthma return rate data for patients with a primary diagnosis of asthma was found to be 2.5% within 7 days, 4.6% within 14 days, and 9.7% within 30 days. It is important to note some unique aspects of the hospital outpatient pharmacy that impacted clinical care such as the provision of education from a pharmacist or pharmacy student, interpretive services, financial services, and pharmacist access to medical charts.

To assess patient/family satisfaction with the medication delivery service during the first 4 months of implementation, an ED outreach nurse followed up with patient/family within 1–3 days of discharge to gather feedback on program strengths and weaknesses. The core team then analyzed survey answers and implemented service improvements based on the advice received. Additionally, time studies, using electronic prescription time stamps, were completed to assess barriers to the quick provision of medication and workflow changes were implemented to overcome these identified barriers.

Analysis

For the primary objective, the percentage of patients who filled ED asthma prescriptions at the hospital outpatient pharmacy was tracked over time utilizing a statistical process control chart. For this analysis, a shift was defined as 8 consecutive data points above the baseline. Additionally, a 2-proportions test was completed to determine whether the increase in hospital outpatient pharmacy utilization was statistically significant (Minitab 17; Minitab Inc, State College, Pa.). A *P* value of < 0.05 was considered significant.

For the secondary outcome of ED revisit data during the first 4 months of program implementation, we assumed a 2% difference in ED revisit rates among subjects who received the delivery service versus those who did not. The study needed greater than 1,000 patients to show a 2% decrease in 7-, 14-, and 30-day revisit rates with statistical power > 80%, assuming 2-sided significance level of at most $\alpha = 0.05$. ED revisit rate data were compared using

Pearson's chi-square test or a Fisher's exact test. A *P* value of < 0.05 was considered significant.

Ethical Considerations

The QI study does not qualify as human subject research per policy; therefore, approval by the Nationwide Children's Hospital institutional review board was not required.

RESULTS

Primary Outcome

As mentioned previously, the percentage of patients who filled ED asthma prescriptions at the hospital outpatient pharmacy was tracked over time utilizing a statistical process control chart. As can be seen in Figure 2, there was a statistically significant increase in the percentage of patients who filled ED asthma prescriptions at the hospital outpatient pharmacy following the implementation of the medication delivery program (22.2% versus 33.8%; *P* < 0.0001).

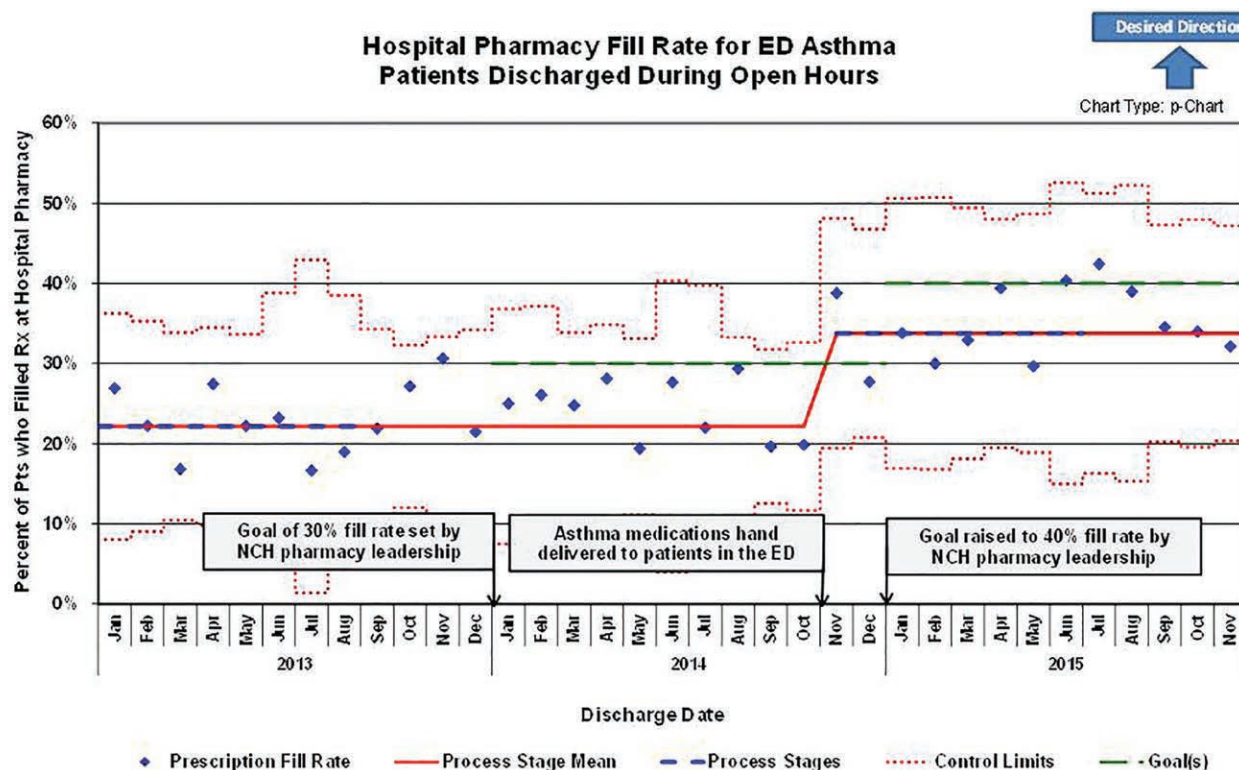
Secondary Outcome

After initiation of the prescription delivery program, 738 patients with a primary diagnosis of asthma were discharged from the ED with asthma prescriptions during the time the pharmacy was open and included in the study (November 10, 2014, to February 10, 2015). Of the 738 patients included in the study, 77 patients filled prescriptions at the hospital outpatient pharmacy and opted to receive the prescription delivery service, and 661 patients received asthma prescriptions from the ED but did not receive the delivery service. As can be seen in Table 1, there were no statistically significant differences between the 2 groups based on demographics and first asthma control score (ACS), which assessed asthma severity upon arrival to the ED. Table 2 summarizes the data for ED revisit rates at 7-, 14-, and 30-day for those who received prescription delivery versus standard of care.

Patient Survey Results

Of the 77 patients who received delivery, 67 patients were called by outreach nurses, and 39% (26/67) completed the patient satisfaction survey. Patients not included were unreachable by phone after 3 attempts. Table 3 shows survey responses.

Based on survey results collected during the first 4 months of program implementation, patients/families reported being satisfied to very satisfied with the service. Additional survey comments showed that patient/families appreciated the convenience of the medication delivery service and the associated education they received. Those who were only satisfied versus very satisfied with the service were the same patients/families who reported that their medications were not ready at the time of discharge. These survey responses were used to improve procedures/communication surrounding the speed of the service.



ED Asthma Pts Rx at NCH	21	20	19	28	26	13	6	11	23	41	38	23	18	18	28	27	25	13	11	37	33	28	38	33	24	21	27	23	28	23	38	34	36		
ED Asthma Pts Disch	78	90	113	102	117	56	36	58	105	151	124	107	72	69	113	96	129	47	50	126	168	141	98	119	71	70	82	99	91	57	66	59	110	100	112

Fig. 2. Statistical Process Control P-Chart demonstrating an increase in the percent of Emergency Department (ED) asthma patients who filled prescriptions at the Nationwide Children’s Hospital (NCH) outpatient pharmacy.

Key Improvement Areas and Specific Interventions for the Project

Figure 3 outlines key improvement areas and interventions for the project. Patient survey results, core team member

Table 1. Characteristics of Patients who did and did not Participate in the Asthma Medication Delivery Program

Characteristic	Delivered (n = 77)	Not Delivered (n = 661)	P
Gender, n (%)			
Female	31 (41)	237 (37)	0.5556
Male	45 (59)	398 (63)	
Race, n (%)			
African/Black/African American	47 (62)	338 (53)	0.3121
Asian	0	10 (2)	
Bi-racial/multi-racial	7 (9)	52 (8)	
Latino/Hispanic	4 (5)	44 (7)	
Patient/family declined	1 (1)	4 (1)	
White	17 (22)	187 (29)	
Age, n (%)			
< 5 y	47 (62)	335 (53)	0.2098
6–11 y	20 (26)	232 (37)	
12–17 y	9 (12)	68 (11)	
Insurance, n (%)			
Commercial	11 (15)	135 (23)	0.2062
Medicaid/Medicaid HMOs	63 (85)	458 (77)	
Other	0	5 (1)	
First ACS			
0–03	36 (56)	344 (62)	0.2039
04–07	27 (42)	182 (34)	
08–10	1 (2)	27 (5)	

HMOs, health maintenance organizations

assessment, and time trials identified communication and time to be the major barriers to the success of the project.

The timing of prescription delivery was a barrier. Although the hospital outpatient pharmacy took an average of 20 minutes to fill prescriptions, ED practice was to wait to send prescriptions to the pharmacy until the decision to discharge was confirmed. To overcome this barrier, providers sent prescriptions earlier and utilized electronic prescribing to improve the speed of prescription receipt and delivery by the pharmacy. The pharmacy prioritized ED asthma prescriptions as urgent in the workflow. ED registration personnel received education on how to scan prescription cards into the electronic medical record so that pharmacy could obtain insurance information from the chart upon receipt of prescription. As a final process to allow continued room turnover in the ED, if prescriptions were not ready at the time of discharge, ED staff and pharmacy created a process to bring families to a separate area to complete pharmacy education.

DISCUSSION

Summary

The department of pharmacy and emergency medicine successfully developed and implemented an asthma prescription delivery service to the ED with a goal of increasing

Table 2. Comparison of ED Revisit Rates between Patients with Medications Delivered Before Discharge versus Standard of Care

Study Group	7 Days	14 Days	30 Days
Delivered (n = 77), n (%)	1 (1.3)	2 (2.6)	5 (6.5)
Not delivered (n = 661), n (%)	27 (4.1)	40 (6.1)	51 (7.7)
P	0.347	0.6095	0.7015

Table 3. Patient Satisfaction Survey Results for Those Participating in the Asthma Medication Delivery Program

Questions	Very Satisfied (%)	Satisfied (%)	Not Satisfied (%)
How satisfied were you with how you were treated by pharmacy staff?	74	26	0
How satisfied were you with the medication counseling provided?	67	33	0
Please rate your overall satisfaction with this service.	64	36	0
Were the prescriptions ready by the time your child was ready to be discharged?	Yes 68	No 32	
Would you recommend this service to your family and friends?	92	8	

Additional comments available upon request.

hospital outpatient pharmacy utilization and decreasing ED revisit rates for asthma exacerbations. This service allowed for increased communication between the hospital outpatient pharmacy and ED staff, greater involvement of student pharmacists, and expanded the clinical

role of outpatient pharmacists. Postimplementation of the medication delivery service, there was a significant increase in the number of patients who filled ED asthma prescriptions at the outpatient pharmacy.

Interpretation

The service described increased the number of patients who went home from the ED with medications as well as related education needed to prevent return visits. We attribute the modest increase in prescription fill rates to several factors. (1) Patients may have the required medications at home. (2) Families may have preferred pharmacies closer to home. (3) The pharmacy delivery wait times were unacceptable. (4) Families may not have known about the delivery service.

Pharmacy delivered a total of 212 prescriptions within the first 4 months of implementation. Of the 77 patients who received prescription delivery during this time frame, 85% received an oral steroid, 74% received a rescue inhaler, 56% received a spacer, 35% received other additional medications, and 29% received a controller inhaler delivered to the bedside. Oral corticosteroid prescriptions, such as prednisolone, were the most common medications given from the ED.

Although it appears that patients who enrolled in the program and had their medications delivered before ED discharge were potentially less likely to return to the ED within 7, 14, and 30 days, our sample size is too small

Title: ED Asthma Medication Delivery Program

Project Leader: Kayla Durkin, PharmD

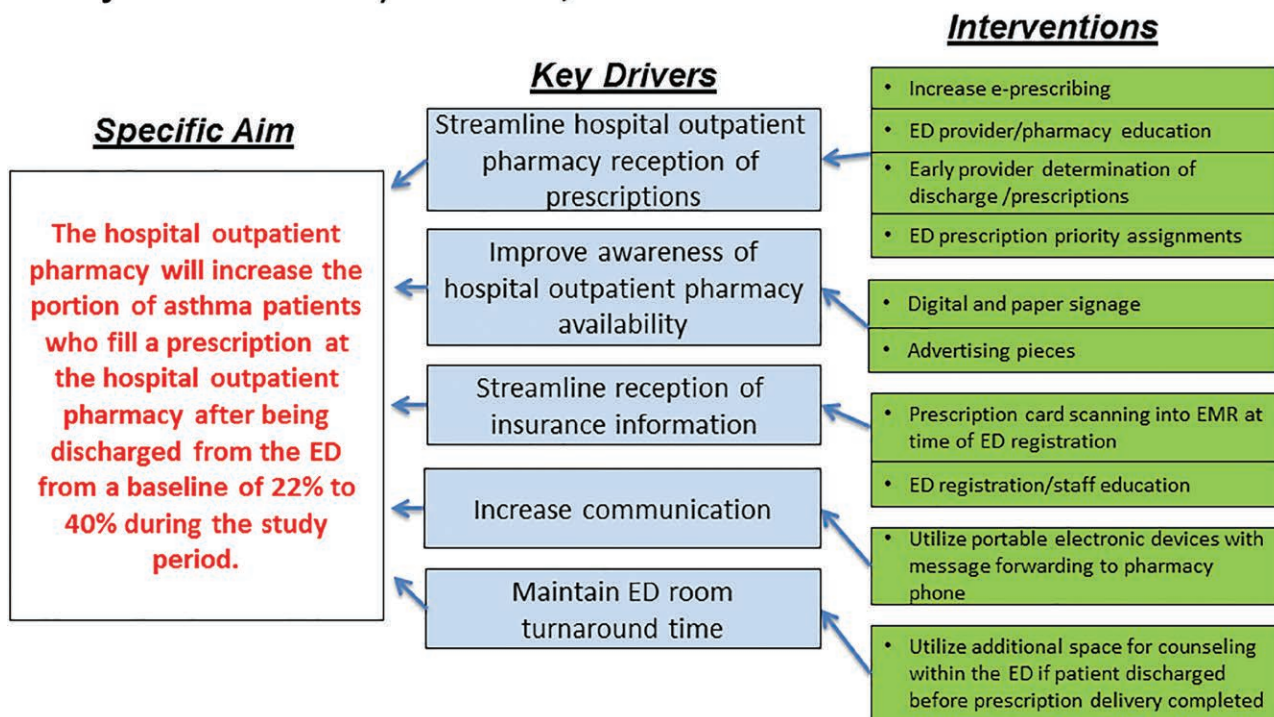


Fig. 3. Key Driver Diagram for Emergency Department (ED) Asthma Medication Delivery Program.

to know for sure. However, it is possible that further utilization of the program could lead to improved patient outcomes in the future. Those who chose to enroll in the program were provided one-on-one education with a pediatric-trained pharmacy staff member in the patient's ED room where there are fewer distractions than at a standard pharmacy pick up window.

Since starting the medication delivery service, there was a notable increase in communication between ED staff and pharmacy overall. Despite improvement in communication, implementation, and replication of the service are challenging due to the fast turnover rates of patients and staff members in the ED. Thus, core member support and continual education to ED staff are essential for the continuation of this service.

Limitations

The major limitation to this project is the small sample size and short study duration. Lack of randomization and opt-in service provision is another limitation. The study did not evaluate reasons why patient/families did not participate. Families may not have been offered or may have declined due to ED length of stay or preferred pharmacy choice. The study did not assess first-fill compliance in patients who did not receive medication delivery or overall medication administration compliance. The study did not collect outside hospital ED utilization. The analysis did not account for ED utilization or possession of needed medications before the study. The study also did not address the type of medications prescribed between those who opted to have medications delivered versus those who did not.

CONCLUSIONS

The hospital outpatient pharmacy decentralized staff to bring asthma prescriptions and medication education to the bedside with a goal of overcoming first-fill compliance barriers as well as decreasing return visits to the ED. In collaboration with the ED and pharmacy staff, the core group successfully implemented an asthma prescription delivery service. This service increased the number of ED asthma patients who filled prescriptions at the hospital outpatient pharmacy during the hours the pharmacy was open. However, due to small sample size, it was not possible to conclusively determine program impact on ED revisit rates 7, 14, and 30 days post discharge during the first 4 months of program implementation.

Future directions of this service include earlier decision making by the ED physicians to prescribe medications to the pharmacy. A study assessing how initial ACSs correlate with admissions is ongoing with the hope that collected data will help providers make earlier evidence-based decisions for discharge and ultimately improve timing for delivery. The hospital outpatient pharmacy has added 0.6 student pharmacist full-time equivalent and 1 pharmacist full-time equivalent

to accommodate increased prescription and patient volume created by this service. Continued data collection is needed to determine if the delivery service significantly decreases ED revisit rates compared with standard of 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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