

Better Outcomes for Hospitalized Children through Safe Transitions: A Quality Improvement Project

Audra Pritt, MD; Anthony Johnson, MD; Jordan Kahle, MS3; Deborah L. Preston, BS-CCRC; Susan Flesher, MD

Abstract

Introduction: This project's goal was to implement an already validated pediatric discharge toolkit to enhance the effectiveness of transition from hospital to home, thus reducing 30-day readmission rates. **Methods:** This quality improvement study involved implementing a pediatric discharge planning toolkit to improve upon predetermined outcome measures. Critical elements in the toolkit included: (1) comprehensive patient risk assessment on admission; (2) teach-back curriculum; (3) fax or phone call to the primary care physician; (4) 72-hour follow-up calls; and (5) follow-up appointments, scheduled before discharge, within 2 weeks from discharge from hospital. We used the toolkit to gather data on pediatric patients as they were admitted and then prepare them for discharge from December 2016 until March 2017. The primary outcome measure was the 30-day readmissions to the hospital, and the secondary outcome measure was patient satisfaction scores. Our balancing metrics included follow-up appointments made and length of stay. These measures were compared with preintervention hospital pediatric administrative data collected from December 2015 through March 2016. **Results:** Data collected during the study period (n = 91) compared to preintervention hospital administrative data collected the year prior (n = 132) showed a 31% reduction in readmissions, 4.8% and 7%, respectively (95% confidence interval 0.68–3.8), $P = 0.004$. Patient satisfaction scores showed no statistical significance. All patients (100%) in both groups had follow-up appointments made before discharge, and the length of stay showed no statistical difference. **Conclusions:** This pediatric discharge toolkit improved the efficacy of transition from hospital to home by reducing 30-day readmissions. Patient satisfaction scores were not reduced by utilizing the toolkit. (*Pediatr Qual Saf* 2021;6:e378; doi: 10.1097/pq9.0000000000000378; Published online December 28, 2020.)

INTRODUCTION

Approximately, 1 in 5 patients discharged from the hospital experienced an adverse event. More than half of them were

From the Marshall University Joan C Edwards School of Medicine, Hoops Family Children's Hospital, Huntington, W.Va.

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*Corresponding author. Address: Audra Pritt, MD, Department of Pediatrics, Marshall University Joan C Edwards School of Medicine, 1600 Medical Center Drive, Suite 3500 Huntington, WV 25701
PH: 304 691-1300; Fax: 304 691-1375
Email: audrapritt@gmail.com

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preventable.¹ Up to three-quarters of these are medication-related.² Over one-third of patients do not complete required follow-up testing after discharge.³ Direct communication between physicians at the time of discharge occurs less than 20% of the time.⁴ A study of patients surveyed at discharge to assess their knowledge revealed that about half could not state their diagnosis. About a quarter could not list all of their medications. A discharge summary's unavailability affects the quality of care in nearly 25% of follow-up visits and contributes to primary care physician (PCP) dissatisfaction.⁵

About 1 in 5 hospitalized patients are readmitted within 30 days after discharge.⁶ The Hospital Readmission Reduction Program in the Affordable Care Act penalizes hospitals with higher than expected 30-day readmission rates. The Children's Health Insurance Program Reauthorization Act identified pediatric readmissions as one of the first measures for development. Pediatric readmissions have recently been added to Medicaid reimbursement policies in several states. Some of the highest reported readmission rates are for chronic diseases including cancer, cardiovascular disease, diabetes mellitus, pulmonary diseases (cystic fibrosis, asthma, and chronic lung disease), seizures, neurologically impaired

and technology-dependent children.^{7,8} In 2016, Amin et al⁹ found that at readmission, parents were more likely than physicians to think that the condition was serious and that the readmission was preventable. However, both thought it was likely that the child may have future hospitalizations.⁹ In 2015, Brittan et al¹⁰ identified that lack of shared understanding and communication difficulties between parents and providers were potential causes of readmission.

Much of the literature discusses the timing, causes, trends, and costs of pediatric readmissions. But little is discussed about tools used to reduce readmissions in the pediatric population. Auger et al¹¹ looked to find if pediatric readmissions have changed over time and found that between January 2010 through June 2016, 7-day all-cause readmissions were unchanged despite national efforts to reduce them. Contradictorily, however, Bucholz et al¹² published in 2019 found that pediatric admissions declined from 2010 to 2016 as 30-day readmission rates increased. However, the increase in readmission rates was associated with more significant admissions for children with chronic conditions. But, when stratified by complex or chronic conditions, readmission rates declined or remained stable across patient subgroups, supporting Auger's findings. The authors suggested that hospitals serving pediatric patients need to account for the rising complexity of pediatric admissions and develop strategies for reducing readmissions in this high-risk population.¹² In a systematic review of pediatric hospital discharge interventions to reduce subsequent utilization, Montalto and Spiegler¹³ reported that 6 interventions demonstrated a reduction in subsequent hospitalization or emergency department use. Four of the 6 positive interventions included both enhanced inpatient education, engagement, and follow-up after discharge.¹⁴

Other research shows that approximately 15% of the population in our state demonstrated literacy/numeracy deficits.¹³ Children with cancer and neurologic conditions have the highest readmission rates (up to 32% and 10%, respectively). Approximately, 25% of inpatient charges were accounted for by the 3% of patients with frequent recurrent admissions.¹⁵ Nearly one-fourth of readmissions following admission for a seizure was due to adverse medication events found to have occurred during the index admission. Readmission rates for asthma and bronchiolitis have been reduced with improved discharge planning and follow-up care.¹⁵⁻¹⁷ Our state is one of the 3 states where all active hospitals are impacted by the readmissions Hospital Readmission Reduction Program penalty. Nationally, we have the highest prevalence of obesity, second-hand smoking exposure, and nicotine dependence. These conditions may not be a direct cause but are underlying factors in readmission care.¹⁸⁻²⁰ Any of the above risk factors should serve as a red flag and alert the healthcare team to look for other potential readmission risks. The discharge toolkit addresses these risk factors.

The BOOST toolkit has been validated in adult settings. In a semicontrolled pre-post study, 11 adult hospitals implementing BOOST reduced their readmission rates by 2% ($P = 0.01$) compared to size-matched control units.²¹ The Society of Hospital Medicine provided guidelines for the implementation of the adult model. The toolkit identifies patients at high risk for rehospitalization and aids in developing specific interventions to mitigate potential adverse events. The toolkit reduces 30-day readmission rates. It also improves patient satisfaction and Hospital Consumer Assessment of Healthcare Providers and Systems scores related to discharge, the flow of information between hospital and outpatient physicians and providers, and communication between providers and patients. Pedi-BOOST, the pediatric model, was adapted from Project BOOST by the University of California: The UC Healthcare Quality Improvement Network (© Pedi BOOST, 2013 – SHM and UC Health QIN).

This study aimed to determine if this pediatric discharge toolkit could improve the transition from hospital to home by identifying barriers before discharge and reducing 30-day readmissions. Our SMART AIM was to determine if the implementation of the Pedi-BOOST toolkit improved the transition from hospital to home, by reducing readmission rates of 20%, improving patient satisfaction scores by 5%, and improving follow-up appointment scheduling during our study period of December 2016 to March 2017.

METHODS

Context

We conducted this quality improvement study at a pediatric inpatient unit of the Hoops Family Children's Hospital (HFCH). HFCH is a children's hospital within a teaching hospital in southern West Virginia that serves West Virginia, eastern Kentucky and southeastern Ohio. HFCH is a member of the Children's Hospital Association and includes a 36-bed Level III Neonatal Intensive Care Unit, a 25-bed General Pediatrics Unit, a 10-bed Pediatric Intensive Care Unit, and a Neonatal Therapeutic Unit. The general pediatrics unit is a mix of general pediatrics and sub-specialty patients with an annual admission volume of 1,400.

Study Design

The study consisted of 2 major sequential phases over 12 months, the planning and implementation. Both phases were facilitated by internal mentors and an external mentor/physician expert in care transitions. We collected preintervention and postintervention outcome data and reviewed our institution's hospital database for readmissions. We used Press Ganey Survey data (Press Ganey Associates LLC, Boston, Mass.) to assess overall patient/parent satisfaction scores. These surveys combine the required Hospital Consumer Assessment of Healthcare Providers and Systems questions with patient-centered

questions to give a comprehensive picture of their patients' care experiences. We also used department records of follow-up appointment completions.

The Marshall University Institutional Review Board approved the project.

Planning

The planning phase consisted of baseline preintervention institutional self-assessment, team development, stakeholder support development, and process mapping. We identified key drivers based on items in the toolkit (Fig. 1). The team was educated regarding needed interventions. We also obtained readmission rate, length of stay, postdischarge hospitalization follow-up appointments before discharge, and patient satisfaction of discharge process using Press Ganey survey scores. Furthermore, we conducted a preimplementation survey to assess the PCP satisfaction of the current discharge process.

Mentorship

An external site mentor was utilized to implement the toolkit. Mentor engagement consisted of kick-off training, development of structured action plans, and 5–6 scheduled phone calls/webinars in the subsequent

12 months between the mentor and the investigators. Mentors gauged progress and helped troubleshoot barriers to implementation. The external site mentor is a nationally known expert on healthcare systems, quality improvement, patient safety, and clinical research.

Toolkit

Permission from the Society of Hospital Medicine was obtained to use and publish the toolkit. The Pedi-BOOST toolkit used in this study was based on the BOOST discharge toolkit developed by the Society of Hospital Medicine (Philadelphia, Pa.).

Team Members

Members included nursing staff, physicians involved in the discharge process (hospitalists and residents), allied health professionals, social work, case management, pharmacists/nutrition/dietary, respiratory therapists, family/caregiver, PCP, and other stakeholders caring for the hospitalized child. The teach-back curriculum used in the toolkit included an educational session with all pediatric nurses provided by the investigator after training by the external mentor to instruct them on the proper teach-back

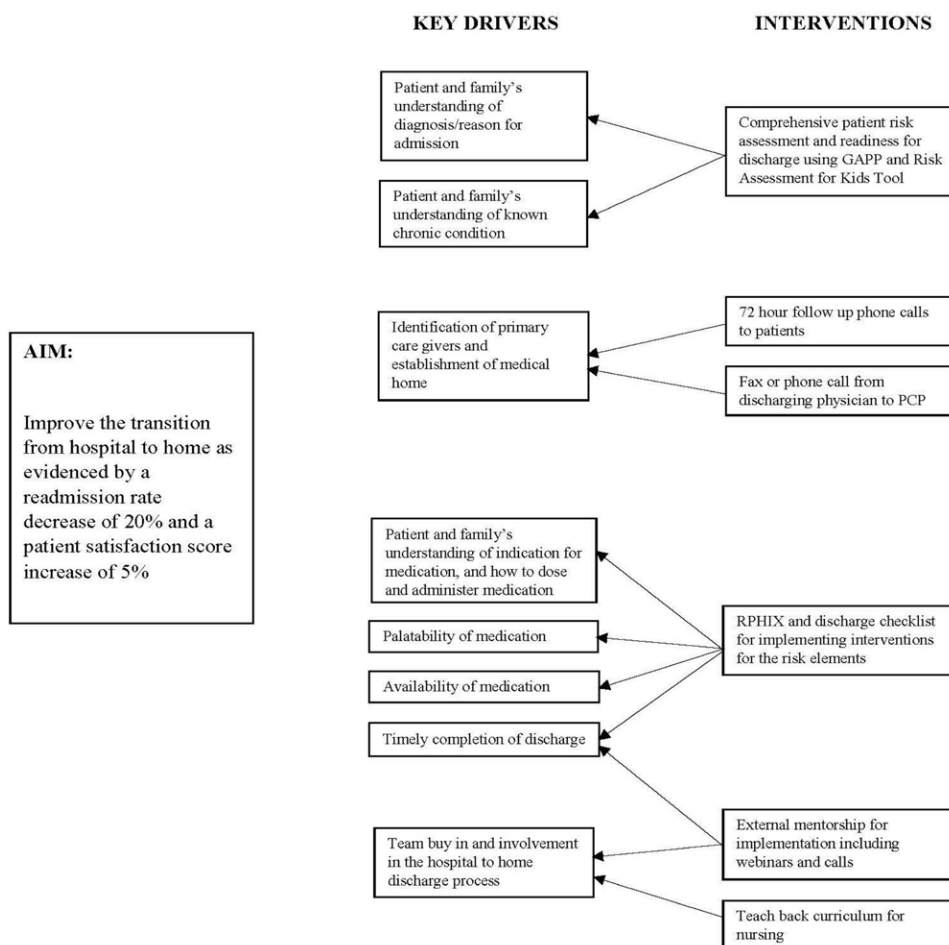


Fig. 1. Key driver diagram. GAPP, General Assessment of Pediatric Patients; RPHIX, Risk Patient Handout Intervention.

technique to educate patients and families about their disease state, medications, and follow-up appointments.

Implementation

The Pedi-BOOST toolkit was implemented and used to identify barriers to discharge for pediatric patients. Patients were then admitted and then subsequently prepared for discharge from December 2016 until March 2017. Critical elements in the toolkit included:

- (1) a comprehensive patient risk assessment and readiness for discharge using General Assessment of Pediatric Preparedness and Risk Assessment for Kids Tool (Fig. 2);
- (2) a teach-back curriculum for discharge instructions;
- (3) a Risk Patient Handout Intervention Tool (Fig. 3) and discharge checklist (Fig. 4) for implementing interventions for the risk elements;
- (4) a fax or phone call from discharging physician to PCP;
- (5) a 72-hour follow-up phone calls to patients;
- (6) timely completion of discharge;
- (7) external expert mentorship; and
- (8) key stakeholders’ buy-in and involvement.

We compared the above elements with the preintervention hospital administrative data collected from December 2015

through March 2016, which is seasonally the busiest time for pediatrics. The toolkit documents were initiated on all pediatric patients upon admission. All team members completed the General Assessment of Pediatric Preparedness form and Risk Patient Handout Intervention Tool for each patient. The Final Checklist was updated throughout the patient’s hospital stay by team members and completed at discharge. Each day we ensured each new patient had the toolkit documents initiated and discharged patients had the Final Checklist completed. Team members identified any barriers to transition home and then attempted to solve them via the appropriate avenues before discharge. The nurses completed the teach-back documentation on the Final Checklist. All toolkits were stored in a locked drawer for later analysis. Follow-up appointments were made for all discharged patients Monday through Friday, and all discharges over the weekend were made the following Monday. Follow-up phone calls were completed Monday through Friday by the Pediatric Unit Clerk using a previously implemented script. Any problems identified were escalated to the nursing supervisor. We used a run chart to follow the progress of our improvements over time.

Statistical Analyses

All statistical analyses were done using GraphPad Prism version 7.03 by GraphPad Software Inc., LaJolla,

General Assessment of Pediatric Preparedness (GAPP) Tool						
Provide a response for every element listed by noting Y (yes), N (no), or U (unsure). In the Solution column, list possible solutions or note R (resolved) if the issue has been successfully addressed. Date, time, and signature of the team member noting the solution should be provided.						
Element	On Admission			Re-Assessment (list date)		
	Completed by (date/time/signature):			Completed by (date/time/signature):		
	Problem? (Yes, No, Unsure)	Solution?	Date/Time Signature	Problem? (Yes, No, Unsure)	Solution?	Date/Time Signature
Primary caregivers identified (all)						
Patient understanding of known chronic condition						
Family understanding of known chronic condition						
Patient understanding of reason for admission						

Fig. 2. General Assessment of Pediatric Patients tool (page 1). This tool helps to identify patient concerns regarding their preparedness to transition from the hospital. It groups concerns into 2 major domains: logistical and psychosocial. Concerns are identified on admission and during the later parts of the hospitalization. The tool clarifies issues that must be addressed around the time of discharge. A sign off of the task ensures completion.

The R-PHIX Tool			
Circle or check by relevant elements and interventions below. Date/time/signature should be clearly tied to the intervention. Any education or review provided should address the patient as developmentally appropriate and any family members who may care for the patient			
PH= Patient handout MHComm = Medical Home communication			
DCSumm = Discharge summary 0 = Other (list): _____			
RISK element	Interventions	Date/Time/Signature of person completing the intervention	Ongoing solution needed? Add to discharge communications
Medications *High Risk Meds (such as narcotics [morphine, hydromorphone, fentanyl]; heparin; IV nutrition) * Liquid dosing * Compounded medication * Poor palatability * > 5 medications	* Medication specific education using Teach Back provided * How to dose and how to administer liquid medications using Teach Back provided * Assure medication in hand prior to discharge or assure selected pharmacy provides compounding services * Dose provided in hospital with flavoring/other to assure tolerance of medication * Review of medication indications, assure best		

Fig. 3. RPHIX tool (page 1). The RPHIX tool helps implement or plan specific interventions or strategies for the risk factors before discharge. RPHIX, Risk Patient Handout Intervention.

Calif. We used Fisher’s exact test to compare readmission rates.

RESULTS

The HFCH pediatric inpatient unit chose to measure three outcomes:

- (1) 30-day all-cause readmissions to the hospital;
- (2) overall patient satisfaction scores; and
- (3) follow-up appointments scheduled upon discharge

In the preintervention control group, 1,888 patients were admitted with 132 readmitted within 30 days (7.0%). In the postintervention study group, 1,908 patients were admitted with 91 readmitted (4.8%), a 31% reduction in readmissions ($P = 0.004$), and an Absolute Incidence Rate Difference of 2.2% (95% confidence interval 0.68–3.8). Patient satisfaction scores remained statistically unchanged from preintervention (89.3%) to postintervention (86.6%) ($P = 0.493$). All patients in the control and study groups had follow-up appointments before discharge. During the preintervention and postintervention periods, the length of stay showed no statistical difference with a P value of 0.885.

Due to our limited data points, we have presented the data utilizing a run chart to assess the effectiveness of our change over time. The run chart helped our team

determine how our discharge toolkit was performing over time and the interventions’ sustainability. Our data demonstrated some rebound in readmission rates after our intervention and the cessation of the paper toolkit. However, by using a run chart, we were able to show some sustained improvement in readmission rates and the impact of our intervention. The mean readmission rate improved from 7.0% to 4.8% with the intervention noted above; however, even after ceasing use of the toolkit, the readmission rates remained lower than preintervention at 5.8%. The median readmission rates also showed sustained improvement from preintervention to postintervention, and after cessation of the toolkit (6.8%, 4.0%, and 5.7%, respectively) (Fig. 5).

DISCUSSION

In 2018, after completing our study, a meta-analysis was published in *Pediatrics* looking at which pediatric hospital discharge interventions affect subsequent health care use or parental satisfaction compared with usual care. In that review, the authors found that coordinating follow-up, discharge planning, teach-back-based parental education, and contingency planning are potential foci for future efforts to improve hospital-to-home transitions.²² In our study, we found that the implementation of a discharge toolkit including comprehensive patient

The Final Checklist			
Element	List any not addressed here and why (or note "none")	Action needed? (list)	Comments
GAPP* elements			
R-PHIX* elements			
Medication Review – why/how/when should I call if concerns			
Teach back* – both patient and family. Include “if/then” scenarios			
	List which given/method used		
Patient handouts – include websites, paper action plans or diagrams (tube use; congenital heart disease, other). After visit summary or other hospital template may be used for additional general information			
Follow-up visit(s) scheduled – including for tests (ECG, follow-up labs, etc). Medical Home follow-up should be within 1-3 days in most cases.			
Medical Home Communication* – this should be “immediately” at discharge or as soon as possible (in			

Fig. 4. Final checklist (page 1). This final checklist is used to ensure completion of all tasks related to barriers/concerns/preventable events as elucidated from the GAPP and RPHIX tools. GAPP, General Assessment of Pediatric Patients; RPHIX, Risk Patient Handout Intervention. The “*” refers to other individual documents of the toolkit, such as the GAPP and R-PHIX tools of Figures 2 and 3.

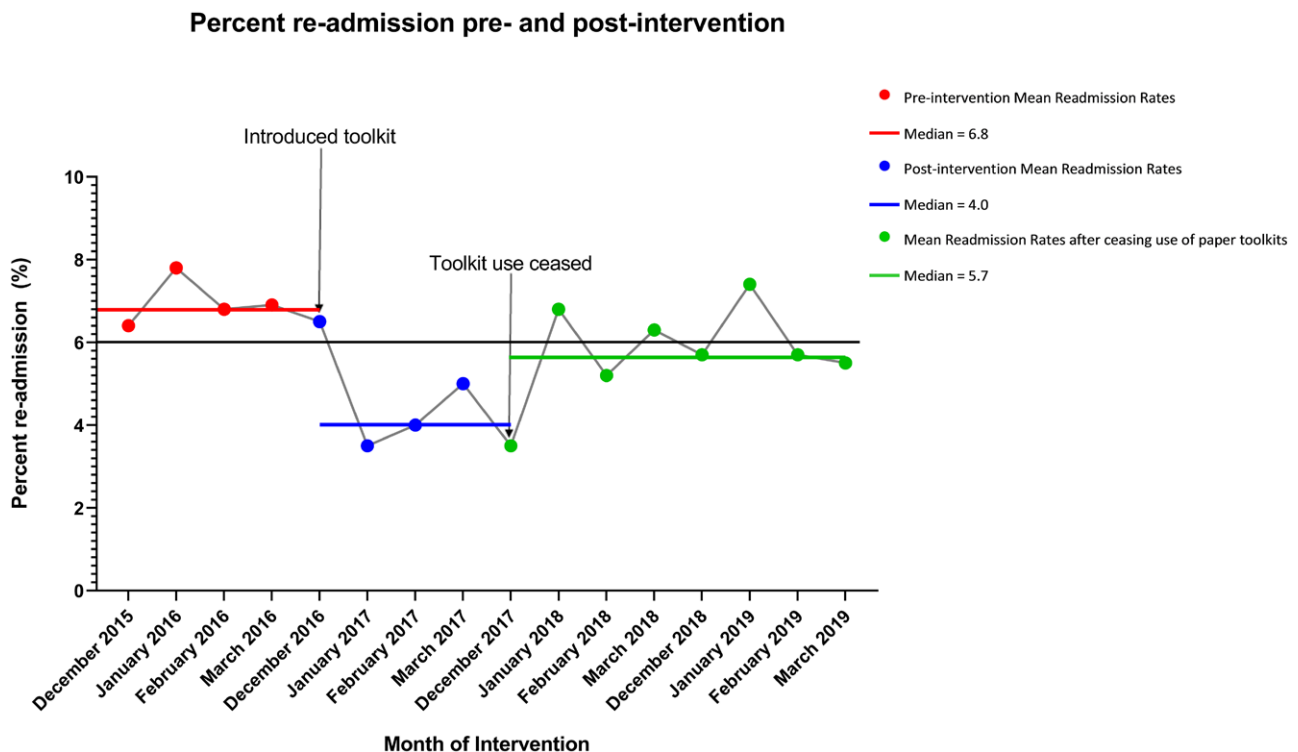


Fig. 5. Run chart. This chart compares the readmission rates for the corresponding four-month periods preintervention and postintervention from 2015–2016 through 2018–2019.

risk assessment on admission, teach-back curriculum, contact with the PCP, 72-hour follow-up phone calls, and follow-up appointments scheduled before discharge was effective in reducing 30-day readmissions in our study group of pediatric patients by 31% when compared to a historical control group. Our study confirms the 2018 *Pediatrics* meta-analysis findings while demonstrating that there is an existing toolkit available for use that has reproducible results.

A recent study has demonstrated an annual increase nationally in pediatric hospital 30-day risk-adjusted readmission rate reaching 7.14% in 2016.¹² Rodriguez et al²³ found that preventability of readmissions was associated with issues concerning the discharge process in 20% of the pediatric readmissions. Shermont et al²⁴ found that implementing a nursing discharge bundle, teach-back methodology with the patient/family, and structured handoff communication effectively reduced unplanned readmissions in pediatric patients. Their methodology was similar to our teach-back methodology used as a part of our pediatric discharge toolkit. Flippo et al²⁵ found that actions as simple as postdischarge phone calls using a phone script, similar to those used in our inpatient pediatric unit, helped reduce readmission rates.

In a systematic review of pediatric hospital discharge interventions to reduce subsequent utilization, 6 interventions demonstrated a reduction either in subsequent hospitalization or emergency department use. Four of the 6 positive interventions included enhanced patient education and engagement component and enhanced follow-up after discharge.¹⁴ Outside of home visits, most of these interventions are included in our discharge toolkit and correlate with the findings in this study of reduced readmissions. These findings demonstrate the strength of our study in its reproducibility.

However, this study does have limitations and weaknesses. The study period was only 4 months; therefore, the readmission rates could vary throughout the year. The 4-month study period was chosen at our institution due to limited resources to conduct the paper collection. The data was then compared to the same period the prior year to attempt to control for seasonal variability. Another limitation is that we conducted this study using paper documents, and our pediatric inpatient unit does not have paper charts. This limitation makes the sustainability difficult; however, we are currently working to incorporate the data collection for the toolkit into our inpatient electronic health record (EHR) system, TouchWorks EHR (Allscripts Healthcare, LLC, Chicago, Ill.).

After the completion of our study, we continued tracking the readmission rates. We have been unable to implement an electronic version of the toolkit due to our institution's plan to merge our current EHR system into a new EHR system. In Figure 5, we show that once we discontinued the use of the paper version of the toolkit that our readmission rates returned to near preintervention levels but still sustained some improvement. Once

the EHR merge occurs, we plan to look at the sustainability of decreased readmission rates by implementing an electronic version of the toolkit. Due to the size of our institution, the reproducibility of these results could vary. The patient satisfaction scores did not show a significant change. We hypothesized that it could be that any noticeable difference to the family may not have been significant since we already conduct family-centered rounds and schedule follow-up appointments at discharge regularly. However, the readmission rates remained improved, possibly due to the more comprehensive approach to care delivered by the entire hospital team. Another balancing metric that we plan to use as we move forward into the more sustainable electronic format is to survey the nurses and the ancillary staff about the toolkit's ease of use, user satisfaction, and perception of benefit to the staff and patients' families.

As pediatric hospitalists, one of our patients' critical goals is a safe transition from hospital to home. Despite our best efforts, patients are sometimes negatively affected by systems that have not been optimized to address their increasingly complex needs and ensure safe transitions during the hospital discharge process. These discharge tools were developed from evidence found in peer-reviewed literature established through experimental methods in well-controlled academic settings. This project's potential impacts were improved patient outcomes, reduced adverse drug events, increased PCP and patient satisfaction, bed capacity improvement, increased reimbursement, improved hospital rating, and reduced medical malpractice costs. Our data add to the ever-expanding pediatric literature that the PediBOOST toolkit applies to smaller children's hospitals with more limited resources and can still significantly impact readmission rates. Although we were not able to analyze all of these variables, the potential for impact still exists.

CONCLUDING SUMMARY

The combination of comprehensive patient risk assessment on admission, teach-back curriculum, contact with the PCP, 72-hour follow-up phone calls, and follow-up appointments scheduled before discharge effectively reduced 30-day readmissions. Thus, this pediatric discharge toolkit improved the efficacy of transition from hospital to home.

DISCLOSURE

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

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