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### Title

A Quality Improvement Initiative to Improve Discharge Timeliness and Documentation

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### Authors

Larrow, Annie  
Chong, Amy  
Robison, Treavor  
[et al.](#)

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summary content and timeliness challenging. Using Quality Improvement (QI) tools to identify barriers to timeliness, we found that preintervention discharge summary template use was low and the content varied. One specific factor affecting completion was “deficiencies,” defined as missing or incorrect information that physicians must correct before finalization. Those deficiencies commonly include admission date, discharge date, discharge diagnoses, and disposition. We aimed to leverage best-known practices, education, training, and EHR modifications to address our gaps. EHR use has demonstrated success in guiding the composition of discharge summaries with standardized, pertinent content.<sup>14</sup>

Our QI project’s goal was to improve the timeliness of discharge summary completion by establishing a completion time expectation, utilizing EHR to redesign the template, and training regarding the discharge summary’s essential content and role in the continuity of care.

### *Specific Aims*

Our SMART aim was to decrease the average time to discharge summary completion by 25% for the PHM service (from 71.5 to 54 hours) in 6 months. Secondary aims were to reduce deficiencies by 50% and increase the discharge summary template use from 62% to >80%.

## **METHODS**

### *Context/Setting*

The study took place in a large, urban, tertiary medical center that is the only freestanding children’s hospital in the region, serving a catchment area of more than 900,000 children. There are more than 20,000 annual pediatric admissions, with approximately 30% admitted to the PHM service, which cares for patients with general pediatric problems and complex chronic medical conditions. Our academic teaching hospital educates multiple levels of trainees from 6 different local residency programs in Pediatrics, Internal Medicine-Pediatrics, and Family Medicine. The term trainee encompasses interns and residents from Graduate Medical Education-accredited programs. More than 40% of the trainees rotate for only 1 month in inpatient pediatrics. The trainees engaged in identifying and implementing solutions throughout the project.

We document and store clinical data using a system-wide commercial EHR (Epic Systems Corporation, Verona, Wis.). Some PCPs work in the same EHR; other PCPs receive clinical reports via either a web-based version of Epic allowing read-only access or auto-faxed reports. After editing and signature by faculty, the discharge summary is sent to the PCPs by the above methods.

### *Planning the Intervention*

Based on PCP feedback, medical staff leadership communicated each section’s performance to section leaders and recommended a review of best practices. PHM faculty,

Pediatric Chief Residents, and Pediatric Residency program leadership formed an ad hoc group to discuss the importance of discharge summary timeliness with trainees and PNP. Soon after, 2 senior trainees established an interprofessional improvement team, including the Chief Medical Information Officer, physician informaticist, health information manager, compliance officer, PHM faculty, and PNPs. The team used QI tools and Plan-Do-Study-Act methodology to understand barriers to improvement and implement interventions. We attempted to survey PCPs about essential elements in discharge summaries but had a low response rate with inconsistent preferences. We used Ishikawa diagrams completed by trainees and PHM faculty, literature review, and local data to identify barriers and potential solutions. The most frequently reported barriers for timely discharge summary completion included (1) the lack of a trainee guideline for discharge summary completion time, (2) documentation burden, (3) difficult-to-use discharge template, (4) competing priorities, and (5) a lack of training on essential discharge summary content (Fig. 1). To identify the most common deficiencies, we sampled 100 random baseline records from August to October 2018. Health Information Management has a standardized review process to identify, count, and track the resolution of deficiencies, defined as missing or incorrect required documentation elements. The most commonly identified deficiencies shown in the Pareto chart were incorrect or missing discharge date and disposition (Fig. 2).

The Institutional Review Board reviewed this QI study and designated it as exempt.

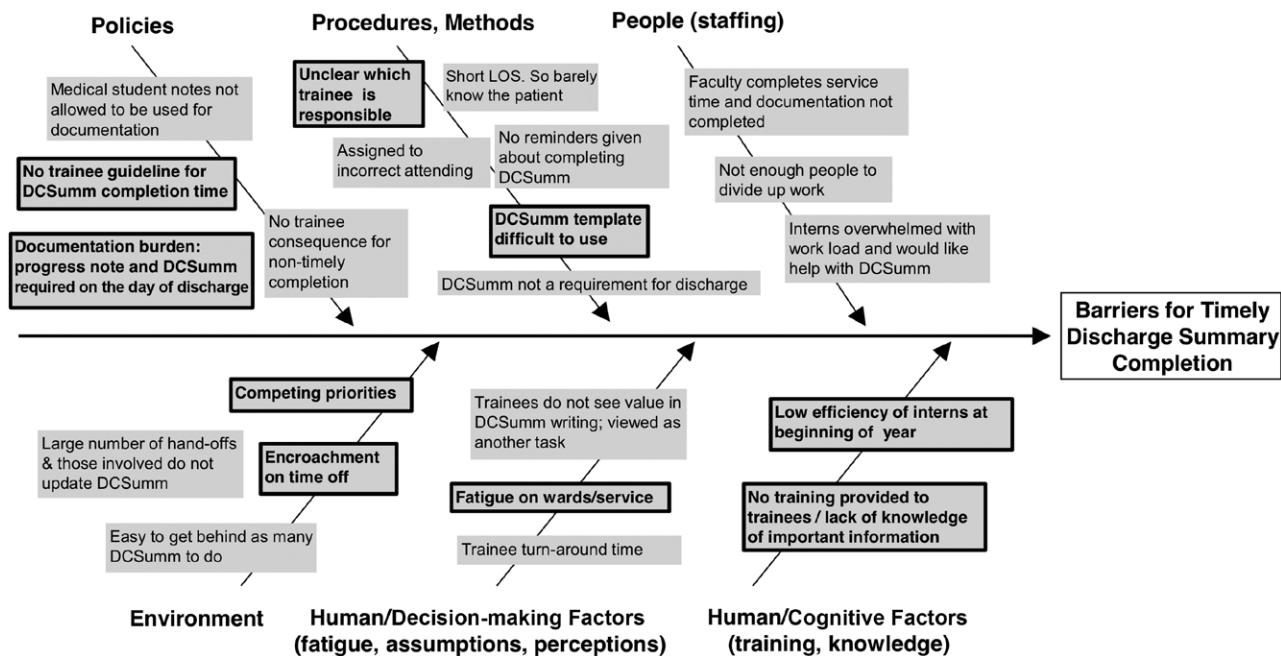
### *Improvement Activities*

#### **Discharge Summary Timeliness Expectations and Education**

In September 2016, the initial ad hoc group began discussions on discharge summary timeliness and the possible goal of 48 hours. In October 2016, the formal improvement group established discharge summary completion expectation within 48 hours of discharge and provided formal education about the discharge summary’s role in the continuity of care. Before this, there was no trainee-specific expectation.

#### **Design and Implementation of New Discharge Summary Template**

Due to the Ishikawa diagram’s recurring theme around difficulties with template use, a new template was designed and launched on April 30, 2018. The design changes targeted known deficiencies and aimed to drive the inclusion of relevant, consistent, and accurate content. We included essential elements that PCPs considered important<sup>7</sup> and designed changes that would be easy to use, given the high trainee turnover. The new template incorporated learning from Pareto and Ishikawa diagrams, and input from PHM faculty and trainees (Fig. 3). The study team addressed common



**Fig. 1.** Summary of the Ishikawa diagram of barriers for timely discharge summary completion by trainees and PHM faculty. Bolded boxes indicate recurrent themes. DCSumm, Discharge Summary; LOS, Length of Stay.

deficiencies through formatting and auto-population of the discharge date and disposition. The team physician informaticist created a novel intervention to address the inclusion of standardized, pertinent content. This intervention included embedded writing tips to deliver specific in-line guidance on best practices, to the author (Fig. 3). These tips disappear when the note is signed and, therefore, do not interfere with the workflow because they do not require deletion. We added drop-down template choices for the hospital course section for common pediatric diagnoses to guide important content. The study team addressed PCP interests via a new

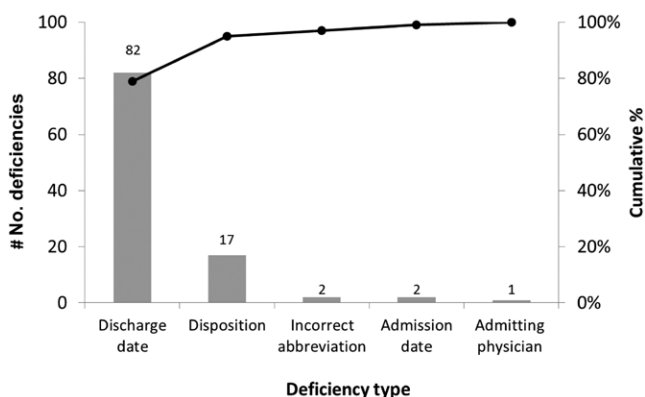
section to call attention to critical ongoing items called “Suggested Next Steps for PCP.” The team constructed these content modifications for ease of use, to decrease the time spent on discharge summaries, and to reduce documentation burden (Fig. 3).

The new template was set as the “default” discharge template for trainees and PNP’s. Because other services also use the template, we obtained feedback and approval from other medical and surgical specialties. Before modification, the discharge summary template user rate was only 62%, with several individuals using personal templates.

We provided structured training on the template to the trainees during an hour-long conference, discussing the discharge summary’s role in the continuity of care and rationale of content, and provided instruction on completing a discharge summary. An EHR tip-sheet was distributed to all trainees. We also provided a training session and EHR tip-sheet to PNP’s. The EHR tip-sheet is given to interns at the beginning of residency and to trainees from other programs at their orientation before starting their inpatient pediatrics rotation. It is also available on the pediatric residency program website.

**Addition of Progress Note Elements to Discharge Summary Template**

Because there was no trainee expectation for discharge summary completion on the day of discharge before this project, our institution required a progress note on discharge for billing requirements. To reduce documentation burden and to incentivize early completion of discharge summaries, we added required progress note elements to the discharge summary template so that a single note



**Fig. 2.** A Pareto chart of the most common discharge summary deficiencies before new template design (n = 100 random sample baseline records from August to October 2018). Incorrect abbreviations include abbreviations not accepted by The Joint Commission on Accreditation of Healthcare Organizations, such as “Qday” or “Mg.”

**Discharge Summary**

**Patient ID:**  
Eddie Asthma  
MRN: H3010419  
Age: 6 y.o.  
DOB: 3/25/2013

**Auto-populated discharge date and disposition**

**Admit Date:** 3/17/2019  
**Discharge Date:** 3/19/2019  
**Discharge Attending Physician:** Pluto Dog, MD  
**PCP:** Donald Duck, MD

**Diagnoses**

Discharge Diagnosis	Date Noted	POA
Microcytic anemia	04/11/2019	Yes

**Resolved Hospital Problems**

Diagnosis	Date Noted	Date Resolved	POA
(Principal Problem) Mild intermittent asthma with status asthmaticus	04/11/2019	04/11/2019	Yes
Hypoxia	04/11/2019	04/11/2019	Yes

**Summary of Medical Decision Making:** Eddie Asthma is a 6 y.o. female with mild intermittent asthma who presented with respiratory distress responsive to bronchodilators in setting of viral upper respiratory infection symptoms treated for status asthmaticus. No evidence of pneumonia with normal CXR without focal consolidation.

**Suggested Next Steps for PCP**  
Labs pending results at time of discharge: None  
**Suggested Next Steps for PCP**  
Significant Findings Requiring Outpatient Follow-up: Hgb 9.9 with MCV 68  
Consultant Recommendations: None

**Reason for Hospitalization**  
Eddie Asthma was admitted for respiratory distress in setting of 3 days of cough, congestion.

Please refer to H&P note for complete details of presenting illness.

**Hospital Course**  
Consults: None

**Procedures:** No orders of the defined types were placed in this encounter.

**Hospital Course:**  
*[TIP] Organize by problem for most patients; complicated patients can be organized by problem or by system. If using a template, make sure to proofread for accuracy and completeness, and add any other problems/info that are not addressed by the template (what was different about this pt than the typical pt admitted for the problem?): :5000*

**#Asthma**  
Eddie, who has mild intermittent asthma, was admitted for management of status asthmaticus. She required treatment with continuous albuterol. She was spaced to scheduled albuterol every 4 hours and every 2 hours as needed on RT driven pathway, and required max support of 2L NC. She was discharged on oral steroids to complete a five-day course. At time of discharge, Eddie was stable on room air and did not require albuterol more than every 4 hours. Trigger was thought to be due to upper respiratory infection. Asthma action plan and asthma education were reviewed with the family prior to discharge and Eddie was instructed to continue scheduled albuterol every 4 hours for 1-2 days.

**Template choices for common diagnoses**

**#Microcytic anemia**  
Suspected to be due to iron deficiency as low MCV and diet history consistent with poor iron intake and large quantities of milk. Iron started  
**Significant Diagnostic Studies:**  
*[TIP] In general, do not copy and paste reports unless requested by service/attending. Include significant studies only, and list significant abnormal findings or denote as "normal" or "unremarkable": :50000*  
Labs: Hgb 9.9 with MCV 68  
Radiology: CXR: normal

**Day of Discharge Events & Exam**

**Subjective/Interval Events:**  
- Weaned to RA overnight  
- Only required albuterol 4 puffs every 4 hours

**Exam:** BP 120/50 | Pulse (I) 60 | Temp 36.1 °C (97 °F) | Resp 30 | Wt 20 kg (44 lb 1.5 oz) | SpO2 97%

**Physical Exam**  
Constitutional: She appears well-developed and well-nourished. She is active.  
HEENT:  
Mouth/Throat: Mucous membranes are moist.  
Cardiovascular: Normal rate and regular rhythm.  
No murmur heard.  
Pulmonary/Chest: Effort normal and breath sounds normal. There is normal air entry. No stridor. No respiratory distress. She has no wheezes. She has no rhonchi. She has no rales.  
Abdominal: Soft. Bowel sounds are normal. She exhibits no distension. There is no tenderness.  
Neurological: She is alert.  
Skin: Skin is warm. No rash noted.

**Condition on Discharge:** Good  
**Discharge Disposition:** Home or Self Care

**Discharge Medications and Treatments**

**Current Discharge Medication List**

START taking these medications	
Details	
ferrous sulfate 75 (15 FE) mg/mL SOLN	Take 3.5 mL (52.5 mg of elem iron) by mouth 2 times daily. Avoid milk or antacids within 2 hours of taking. May discolor urine and feces. Qty: 210 mL, Refills: 2
PROAIR HFA 108 (90 Base) MCG/ACT inhaler	Inhale 4 Puffs by mouth every 4 hours as needed for Shortness of Breath or Wheezing. Qty: 1 Inhaler, Refills: 2

**Follow up/Information Provided to Family**  
Activity: activity as tolerated  
Diet: regular diet

Return precautions reviewed with teach-back.  
No future appointments.

**Signed:**  
Pluto Dog, MD  
4/19/2019

*[Reminder - REFRESH entire note & update Date of Service ("t" for today), then "F2-delete" this. Mark sensitive notes as "sensitive"]]*

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**Fig. 3.** New discharge summary EHR template displaying key elements: (1) Auto-populated discharge date and disposition; (2) New section "Suggested Next Steps for PCP"; (3) Embedded writing tips to deliver specific guidance to note author (disappear automatically when the note is signed); (4) Example template choice for asthma exacerbation. Specific template choices available for common diagnoses: acute viral gastroenteritis, asthma, anaphylaxis, bronchiolitis, BRUE, uncomplicated cellulitis, cervical lymphadenitis, constipation (functional) cleanout, croup, fever in infant, diabetes new-onset, diabetic ketoacidosis, Kawasaki disease, simple pneumonia, seizure, UTI without bacteremia, and UTI with bacteremia.

could be written on the day of discharge. The discharge summary template was designed to satisfy all regulatory and billing agencies.

**Study of the Intervention Measures**

The primary outcome measure was average hours to discharge summary completion on the PHM service. We collected the discharge summary completion time of all records and averaged monthly. Baseline discharge completion time was collected from March to September 2016 of all PHM records before the hospital leadership attention to discharge summary timeliness and the initiation of our PHM-driven improvement project. Additional measures were the percentage of discharge summaries with deficiencies and rate of discharge summary template use. All

records were measured monthly and then averaged over 6 months before and posttemplate release.

As a balancing measure, we quantified discharge summary character count as an average over 12 months before the new template and posttemplate release by creating an EHR report to count the number of characters of all PHM discharges.

To investigate the discharge summary template's impact on efficiency, readability, and effectiveness, we surveyed end-users. Six months after the new template launch, we distributed paper surveys to a convenience sample of PCPs. The survey asked the ideal time frame to receive discharge summaries by the selection of one of the following responses: "same day patient discharged"; "next day of discharge"; or "within 2 days, 3-5 days, or 5-7 days of discharge." The survey also included a 5-point

Likert scale in ranking perceived timeliness from “much worse” to “much better” for the receipt of discharge summaries following the new template’s adoption. The survey also asked PCPs the elements they valued in the new discharge summary template: “Suggested Next Steps for PCP,” inclusion of only “Significant Diagnostic Studies,” and new formatting.

Eighteen months after the new template launch, the study team distributed a separate email and paper survey to trainees and PNPs, which asked about the new template’s ease of use, the value of embedded writing tips, and template choices for common diagnoses. A 5-point Likert scale from “strongly disagree to “strongly agree” was used.

### Analysis

We used statistical process control for our primary process measure of average hours to discharge summary completion each month, displayed on an Xbar chart, and the range of hours displayed on an R chart. We used established rules for differentiating special cause variations to allow for changes in control limits.<sup>15</sup> We used summary statistics to analyze deficiency, template use, character count, and survey data.

## RESULTS

The baseline discharge summary completion time during March–September 2016 was 71.5 hours ( $n = 2729$ ) (Fig. 4A). The mean completion time decreased to 44.1 hours in October 2016, meeting special cause variation, after completing informal and formal education around expectations and the discharge summary purpose. Variability was also reduced—a 64% reduction of the range from 15.2% to 5.4% (Fig. 4B). We introduced the new discharge summary template in April 2018 and further modified it with the addition of progress note elements in June 2018. By September 2018, the mean completion time decreased to 21.8 hours, meeting special cause variation (Fig. 4A). Gains were sustained post intervention for 9 months without further shifts in the mean.

Before the new template, 4.5% of baseline discharge summaries had deficiencies, most frequently missing or incorrect discharge date and disposition (Fig. 2). After the new template implementation, deficiencies decreased to 2.5% (44% reduction), still most commonly missing or incorrect discharge date and disposition. Discharge summary template use increased from 62% to 97%.

From a convenience sample of PCPs ( $n = 33$ ) surveyed, 59% perceived the timing of receipt of discharge summaries as “much better” or “better,” with none rating it as “worse” or “much worse.” All PCPs surveyed thought the ideal time frame to receive discharge summaries was within 2 days of discharge. PCPs also valued several elements of the new template, including “Suggested Next

Steps for PCP” (88%), the inclusion of only “Significant Diagnostic Studies” (73%), and new formatting (58%).

Of the trainee/PNP ( $n = 45$ ) survey respondents, 83% reported that the new discharge summary template was simple to use, and 81% perceived that eliminating the progress note on the day of discharge helped reduce time spent on documentation. Trainees and PNPs both valued embedded writing tips (80%), mainly when first using the template, and most of them thought that the specific template choices for common diagnoses guided them on section content (87%).

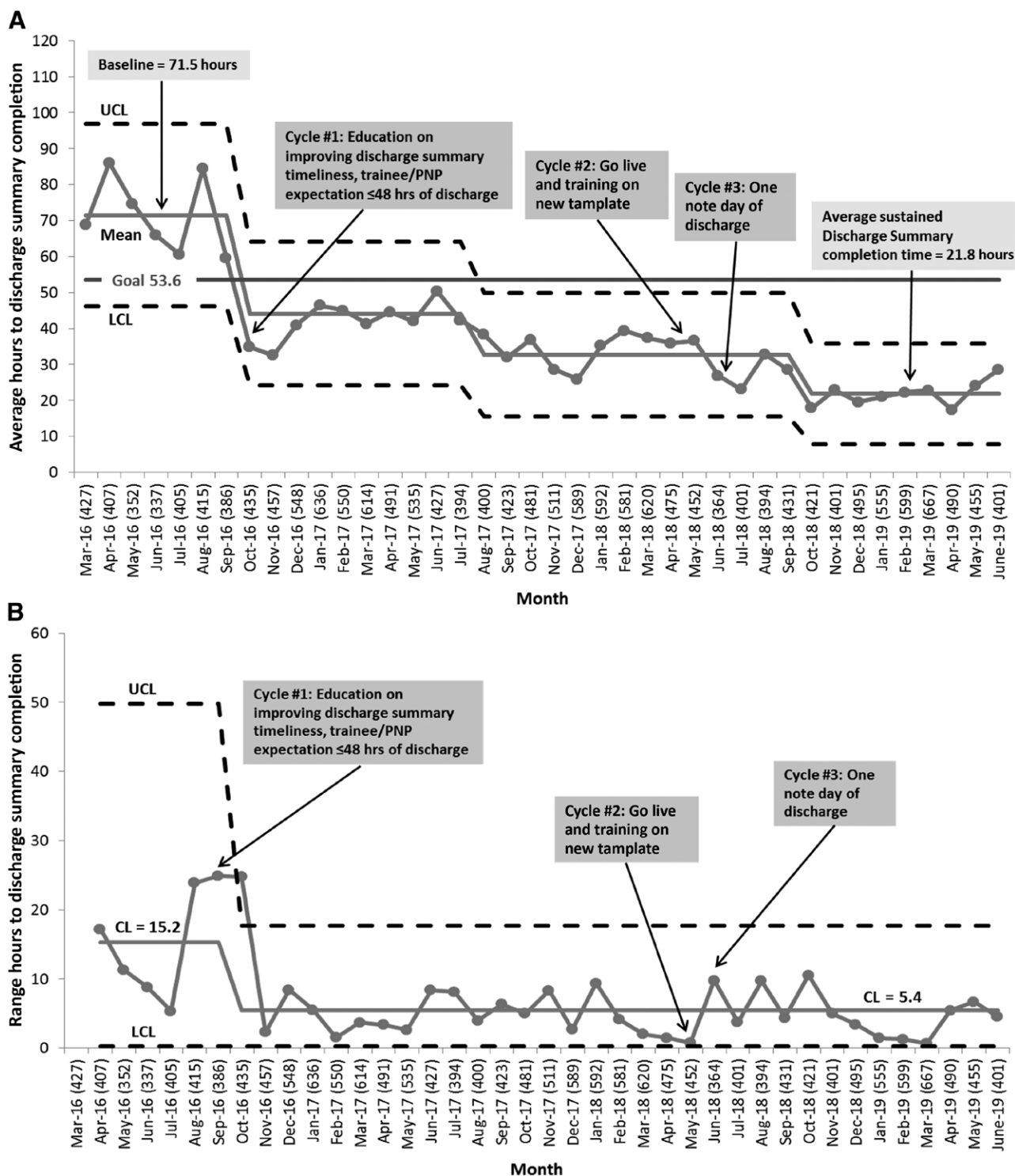
The balancing measure of the average character count of discharge summaries did not increase with these added features (an average of 7151 to 6790 characters or a 5% decrease).

## DISCUSSION

Using QI methodology, we exceeded our primary SMART aim and reduced discharge summary completion time by 70%, from 71.5 to 21.8 hours. At our institution, we generally recommend that the patient see their PCPs within 1–3 days of hospital discharge. Therefore, the PCP must receive timely information concerning the hospitalization to facilitate ongoing care.<sup>13</sup> For most patients, communication through a discharge summary is considered sufficient.<sup>16</sup> Delays in timely discharge communication have been associated with poorer quality of care,<sup>4,17</sup> medication errors,<sup>2,3</sup> readmissions,<sup>18</sup> and increased costs.<sup>19,20</sup> In 2009, the Value in Inpatient Pediatrics Network’s Transitions of Care Collaborative (a consortium of 16 pediatric PHM programs working to assess and improve the quality of discharge communication between pediatric hospitalist and PCPs) established a goal of hospitalist-PCP discharge documentation within 2 calendar days.<sup>7,9</sup> We were able to improve discharge summary timeliness at our institution to an average of <1 day, improving receipt of discharge summaries by the time of PCP postdischarge visit.

Without a completion time expectation, trainees had varied workflows, delaying discharge summary completion. Setting a 48-hour expectation and being educated on the importance of timely communication and patient safety motivated trainees, leading to an immediate impact on our primary outcome. Establishing this expectation time to all new trainees during orientation enforced best practices early, leading to a culture change. However, sustainability needed to be addressed to support initial efforts. The newly designed template that addressed workflow and barriers to completion allowed our culture change to sustain and succeed.

Professional physician organizations<sup>13</sup> and regulatory agencies (Medicare and The Joint Commission) have recommended timely discharge communication with standardized content.<sup>21</sup> At our institution, we had the additional challenge of educating trainees with a high turnover. In this study, we also met our secondary aim of increasing the discharge summary template use to 97%,



**Fig. 4.** Discharge summary completion time. A, Control chart of average hours to discharge summary completion. The total number of discharge summaries for each month described on the x axis. B, R chart of hours to discharge summary completion. The total number of discharge summaries for each month described on the x axis. CL, Center Line.

thereby improving our documentation standardization. The embedded writing tips helped guide users to convey similar information.

Our newly designed discharge summary template had several unique features (Fig. 3). Embedded writing

tips for delivering in-line guidance and template choices for common diagnoses were novel features designed by our physician informaticist. To our knowledge, these embedded tips are not described in previous literature. We found that the average character count of discharge

summaries did not increase; instead, it demonstrated a modest decrease. This change may reflect more concise summaries with only necessary content, guided by the template choices for common diagnoses and embedded writing tips. We also approached but did not reach our other secondary aim of reducing discharge summary deficiencies (missing or inaccurate required documentation) by auto-populating these sections in our new template. We suspect that this may have been due to deleting the auto-populated elements, incorrectly selecting drop-down choices in the template, or due to not using the template. Eliminating deficiencies reduces the time spent on correcting summaries before attending signature and releasing to PCPs. We believe that these design changes were critical to improve our discharge summary timeliness. The changes improved the ease of the template use and offered guidance to the trainee/PNP to improve the quality of writing, thereby reducing faculty review and editing time.

To understand the impact of the discharge summary template's effectiveness and efficiency, we surveyed PCPs. Overall, they responded positively, suggesting that the new template provided the information they required for patient continuity of care. We were able to reduce discharge summary completion time to the PCPs' ideal time frame within 2 days of discharge. The positive survey response from trainees and PNP suggest that the template changes helped reduce time spent on documentation and guided the inclusion of essential elements.

This study demonstrates how a completion time expectation and a thoughtfully designed EHR discharge summary template with training can improve discharge summary timeliness, thereby improving discharge communication between hospitalists and PCPs. The template can ensure standardized content with decreased variability, even in a setting with a high volume of trainees and turnover.

### Limitations

This QI initiative took place at a single tertiary hospital, and some improvements within our EHR may not be generalizable to others. This study focused only on the PHM section results; however, our service discharges approximately one-third of patients admitted to the institution. All medical specialties covered by trainee services use the new template, thereby influencing half of all discharges. Further investigation is needed to determine if similar results occurred with other specialties. We measured the completion time of discharge summaries and could not track arrival time to the PCP; so we may not have accounted for delays in the process, such as faxing or problems with the EHR. We were unable to assess the specific detailed content of the discharge summaries, but the average character count decreased. It is difficult to assess if this is due to the embedded writing tips recommending only necessary information, reduced addendums needed by attending physicians, or due to missing or

inaccurate content. Given this uncertainty, we focused on balancing measures such as end-user experience, which showed ease and efficiency of template use by the trainees and PNPs and PCP satisfaction. That said, the PCP survey resulted from a convenience sample, which poses a risk for selection bias.

## CONCLUSIONS

QI methods enabled our team to dramatically improve discharge summary timeliness to <1 day, allowing receipt before PCP postdischarge visit to ensure adequate continuity of care. A newly designed discharge summary template, with novel embedded writing tips and template choices for common diagnoses to standardize content and streamline communication, was critical to achieve and sustain our goals. Our next improvement steps for this project will focus on further reducing persistent deficiencies, creating more template choices for other common diagnoses, and further examining the quality of discharge summaries while assessing end-user experience.

### Implications

Our study demonstrates methods to optimize discharge summary timeliness in a busy tertiary care pediatric medical center with a high turnover of trainees. Innovations in template design with embedded writing tips and consolidating note types on the day of discharge can improve the timeliness of completion, reduce variability in content, and maximize documentation efficiency. If generalized to other busy medical centers, these methodologies could streamline the transition of care to PCPs to provide better patient continuity.

## DISCLOSURE

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

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