RESEARCH ARTICLE

Improving Efficiency of Primary Care Provider Communication for Uncomplicated Admissions

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ABSTRACT

BACKGROUND: Communication between inpatient pediatric hospital medicine (HM) and primary care providers (PCPs) is important for quality care. As provider workload increases, it is important to focus on a means to improve communication efficiency. Our goal was to increase the percentage of HM admissions using 1-way communication from 0% to 35% over a 16-month period.

METHODS: HM providers and PCPs collaborated to identify 12 admission diagnoses for which 1-way communication could be used. Using quality improvement methods, we studied the implementation of "Leave a Message" (LAM) calls for 1-way communication and providing PCPs with the option to place a return call. Control charts were used to track LAM call use and balancing measures of PCP return phone calls, additional PCP communications, and 7-day readmissions over time.

RESULTS: A total of 778 LAM calls were placed by HM providers over 16 months. The percentage of LAM calls out of all PCP calls placed ranged from 0% to 35% during this time, increasing significantly during winter months and before the coronavirus disease 2019 pandemic. Only 0.4% ($n = 3$) of LAM calls were returned by PCPs. Estimated PCP return phone calls were reduced by 11.1 calls per week.

CONCLUSIONS: We created a system for 1-way telephone communication between HM providers and PCPs for common, simple admissions and reduced the need for PCP return phone calls. The low percentage of LAM calls returned by PCPs may suggest that 1-way communication is adequate for most simple admissions.

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The number of annual admissions to our hospital medicine (HM) service has increased over recent years at a time when admissions involving medically complex patients are increasing as well.[1,2] These changes have led to increased provider workload, which is associated with decreased efficiency and increased adverse events.[3–5] As workload and workflow interruptions continue to increase, it is important to identify ways to reduce unnecessary work.

Paging and texting interruptions are common in the hospital setting and routinely require inpatient providers to multitask. Given that up to 24% of hospitalists' time is spent on communication,[6] eliminating unnecessary work in communication systems provides a significant opportunity to improve efficiency and reduce the time spent on care coordination and documentation. Additionally, efforts to improve communication efficiency have been shown to be beneficial for improving physician clinical satisfaction, which is important for reducing clinician burnout.[7] Although communication between inpatient and outpatient providers remains an important part of patient-centered care for hospitalized patients,[8,9] finding ways to optimize communication systems while maintaining safe transitions from hospital to home is important. A recent study surveying primary care providers (PCPs) found that direct communication with inpatient providers was only necessary for admissions meeting specific criteria, including medical complexity, the need for close follow-up, and complicated social situations.[10]

Previous work at our institution established a system with the goal of reliable, 2-way verbal communication with PCPs for all patients admitted to the HM service using telephone calls initiated within 24 hours of admission. Quality improvement projects were previously able to reach >85% reliability for PCP phone calls placed by HM providers during the patient admission.[11,12] However, the number of pages and discrete phone calls involved in this process often results in numerous workflow interruptions for both HM providers and PCPs (Fig 1A) on the basis of our experience and provider feedback. We have found that the reliability of our PCP communication system has waned over time, potentially because of process complexity and the time required to complete communications for each patient. It frequently takes multiple hours for the PCP to place the return phone call, adding to the inefficiency and communication challenges with our previous system. Additionally, HM providers are often connected with nurses or medical assistant representatives from PCP offices, reducing the efficacy of the system established to facilitate direct discussion between inpatient and outpatient physicians.

Deimplementation of hospital processes can be an effective means of removing or simplifying overly complex processes in the health care systems.[13] Inefficient or inappropriately intense processes can be improved by reducing unnecessary work and streamlining communication systems.[14] To reduce provider work and inefficiency associated with our PCP communication system, we focused on reducing unnecessary work by developing a simplified 1-way communication system for uncomplicated admissions that does not require multiple phone calls for providers. With this project, we aimed to increase the percentage of uncomplicated HM admissions for common diagnoses using effective 1-way communication from 0% to 35% over a 16-month period.

METHODS

Context

This project included patients admitted to the HM service at the main campus of an academic tertiary pediatric hospital with

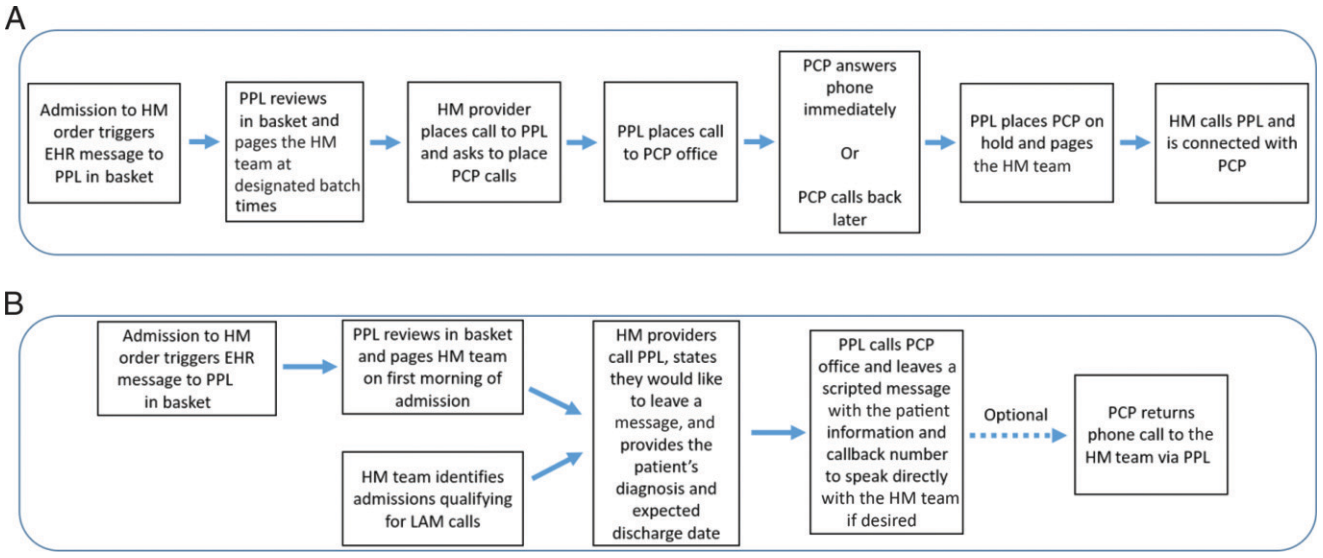

FIGURE 1 Process maps for 2-way communication and LAM calls. A, Schematic diagram of previously established PCP communication system. B, Schematic diagram of the LAM call process with optional PCP return phone call. EHR, electronic health record

>8000 HM admissions per year. The main campus HM service is made up of 4 resident teams consisting of intern- and senior-level resident trainees, HM fellows, and HM attending physicians. All patients admitted to these teams were included in the project. Admissions to a fifth HM team dedicated to patients with medical complexity were excluded from this project.

Our previously described PCP communication system uses a specialized group of Physician Priority Link (PPL) operators to ensure reliability. Previous work using this system has been focused on improving reliability through PPL reminder pages to HM providers, batching PCP calls at specific times in the day, and increasing the percentage of phone calls occurring before patient discharge by initiating calls at the time of admission rather than on the day of discharge.[11,12] This work created a system that requires numerous pages and phone calls through PPL to eventually connect HM providers directly to PCPs (Fig 1A). Unpublished time studies of our PCP calls revealed that the average call time was 2 minutes and 20 seconds (range 1:27–4:25; $n = 12$), not including the time required for the HM provider to respond to the page from PPL.

Of note, baseline data collection revealed PCP call placement reliability to be 55%, which is well below the previously published rate of >85%.[12] Because of this finding, interventions to improve and maintain PCP call placement reliability were also introduced over the first 2 months of the study period; these interventions were focused on resident reminders and PPL operator retraining. During the 16-month intervention phase of this project, the PCP communication median reliability was maintained between 74% and 85%.

Intervention Development

A qualitative survey of community PCPs designed to assess satisfaction with the HM communication process revealed that many PCPs thought that 2-way communication was not required for all admissions, particularly admissions for uncomplicated, common diagnoses.

Some PCP offices revealed that they instruct their staff to take admission calls from HM providers instead of connecting them with the PCP physician, further suggesting the limited utility of the previously established system to facilitate communication between providers. Potential 1-way communication methods were discussed with a leadership group representing PCPs in the surrounding area. Telephone calls within the first 24 hours of admission remained the preferred method of communication, in line with preferences defined in previous work.[12] The PCP leadership group agreed that effective communication for simple admissions could be achieved with 1-way communication, making PCP return phone calls optional rather than required. To define admissions appropriate for 1-way phone communication, a group of PCPs and HM providers collaborated to create a list of common admission diagnoses for which care was generally standardized via existing evidence-based care pathways. Nine qualifying diagnoses were initially identified, and 3 additional diagnoses were added during the study period informed by HM and PCP feedback (Fig 2). Exclusion criteria that would necessitate 2-way communication, including diagnoses like asthma and failure to thrive that require PCP coordination, were also defined. Coronavirus disease 2019 (COVID-19) was added to the exclusion criteria during the study period. These diagnoses and exclusion criteria were used to define admissions that qualified for "Leave a Message" (LAM) PCP calls. The decision to use an LAM call for a patient admission was left to HM providers given the multiple subjective factors, including unexpected disease progression, social concerns, need for clarifying information, and so forth. (Fig 2). We estimated that up to 35% of HM admissions might qualify for LAM calls on the basis of these criteria.

The LAM call process uses the infrastructure previously put in place for our PCP communication system (Fig 1B). To place an LAM call, the HM physician provides the PPL operator with the patient's admitting diagnosis and expected discharge date via phone call. This information is used to populate a scripted message (Fig 3) that the operator reads to provide the PCP office representative with basic patient and admission information, as well as the option for the PCP to place a return phone call. All admissions that did not qualify for an LAM call used our standard 2-way communication system.

Study of Intervention Implementation

Model for Improvement methodologies were used to study the implementation of the LAM call for patients admitted to the main site of our institution.

Pilot Study

A single HM team was used to pilot the implementation of LAM calls over an 8-week period. The HM team residents, attending physicians, and PPL operators were trained on the new call process before starting the pilot phase. Weekly meetings with residents and PPL staff were held to gather feedback and clarify process questions. HM attending and PCP leadership group feedback based on experiences from the pilot phase were obtained during small group meetings.

Plan-Do-Study-Act Cycle 1

After the successful pilot phase, LAM calls were spread to all 4 HM teams. LAM calls were initially rolled out to 1 additional team for 1 week to determine any possible logistic issues and then to all teams the subsequent week. Resident education about rollout of LAM calls, including their inclusion and exclusion criteria and process of placing LAM calls through PPL, occurred via e-mails to the residency program and monthly presentations at resident conferences. HM attending and fellow education occurred via e-mail and presentations at weekly HM division meetings. PCPs were also made aware of the implementation of LAM by presentation at a PCP leadership group meeting and via e-mail to all PCP groups at the time of rollout to all HM teams. PPL operators

LAM Call Inclusion Diagnoses	LAM Call Exclusion Criteria
• Bronchiolitis • Pneumonia • Croup • Dehydration secondary to respiratory illness[a] • Positive for flu, respiratory symtpoms[a] • Positive for flu, dehydration[a] • Cellulitis • Gastroenteritis • Constipation • Urinary tract infection • Hyperbilirubinemia • Medically cleared awaiting inpatient psychiatric admission	• History of medical complexity ○ Technology dependent, followed by ≥3 specialists • Directly admitted by PCP • PICU transfers • Uncertain diagnoses • Asthma, FTT, neonatal FUS, COVID-19[a] or any other diagnoses not listed above • Patients not progressing as expected, including those with qualifying diagnoses or admitted beyond the planned discharge date • Recurrent admissions for similar diagnoses • Any specific concerns from the family or HM team that could potentially be addressed by the PCP

FIGURE 2 LAM call inclusion diagnoses and exclusion criteria. The left column is a list of admission diagnoses qualifying for a potential LAM call. The right column includes clinical criteria that, if met, exclude a patient from qualifying for an LAM call. FTT, failure to thrive; FUS, fever of unknown source. [a] Denotes diagnoses and exclusion criteria that were added during the study period.

were made aware of the LAM call spread to all teams as well.

Plan-Do-Study-Act Cycle 2

A decrease in use occurred 2 weeks after rollout to all HM teams, corresponding to the start time of a new intern resident class. To improve use, we implemented a process change to include monthly announcements at HM resident orientation meetings made by project leaders. Monthly e-mails to residents at the beginning of their HM rotation and weekly e-mails to HM attending physicians before starting service were also added 4 weeks later to educate providers about LAM inclusion and exclusion criteria and the process of placing LAM calls.

Data Collection

For all PCP communications PPL operators recorded the time, date, and type of communication (LAM versus standard 2-way communication). This information was stored in a secured system using 1Call software (Amtelco Co, McFarland, WI) during the first 7 months of the project and transitioned to an information storage method within our Epic electronic medical record system (Epic Systems Corp, Verona, WI) for the remainder of the study period. All phone calls were also recorded, and recordings were stored on secured servers. These recordings were reviewed by project team members intermittently for quality control and when data discrepancies occurred.

Measures

The outcome measure for this project was the percentage of HM admissions using LAM 1-way communication out of all HM patients for whom PCP communication was initiated. This measure was selected because the main concern of the study group was to implement a new communication method that was designed to replace an existing, more time-consuming method. Therefore, the study group decided to measure the percentage of LAM calls to assess opportunities for simplified communications. A balancing measure of the percentage of LAM calls that PCPs returned was used to assess the appropriateness of LAM calls from the PCP viewpoint. Additional balancing measures included additional PCP communications initiated by HM providers after an initial LAM call and 7-day readmission for patients with LAM calls placed during their admission.

> [Patient name] was admitted to *** on [date of admission]. [He or she] has been diagnosed with [admitting diagnosis] and is progression without complication. [His/Her] expected discharge date is [date of expected discharge]. The medical team does not require a return phone call, but if you would like to speak with the team to provide additional information or give recommendations for treatment, please call ***-***-****.

FIGURE 3 LAM PPL script. Shown is the script read by the PPL operator to PCP office representative during LAM calls. Portions within brackets included information autofilled from patient demographics or provided to PPL operators by HM providers.

Analysis

Annotated control charts and established rules for analysis were used to track total HM admissions, LAM call use, and LAM calls returned by PCPs over time.[15,16] Baseline trends were established on the basis of the 4 weeks before the first phase. Standard control chart principles were used to determine special cause variation. These data were analyzed throughout the study period to provide feedback.

Ethical Considerations

Our project was conducted in accordance with institutional review board policies and was exempt from formal review as a system improvement project.

RESULTS

A total of 6726 admissions to the main campus HM service occurred over the 16-month study period. For these admissions, PCP communication occurred for 5313 (79.0%). The percentage of LAM calls out of all PCP communications increased from 0% to 35% over the first 9 months of the study period, followed by subsequent median line decreases to 8% in the following 7 months (Fig 4). After the initiation of the first plan-do-study act cycle, there was a partial adoption of LAM call practice leading to special cause variation. This initial increase in use waned in July of 2018, coinciding with a transition to new incoming intern residents.

To improve LAM call use, a second plan-do-study act cycle involving HM resident education about the LAM call criteria and process via in-person presentations and e-mail reminders was performed. These educational interventions led to an increase in LAM use to 21% of all PCP communications. There was a subsequent increase in LAM use to 35% that correlated with an increase in admissions for respiratory illnesses, suggesting a seasonal effect on use. After a rise in LAM call use during the winter months, there was a decrease in use, which corresponded with decreased overall patient census. A further decrease in LAM call use occurred with the onset of the COVID-19 pandemic, at which time HM providers were told not to place LAM calls for patients under investigation or positive for COVID-19. An 8% use was maintained over the final 4 months of the study period.

Over the entire study period, a total of 778 LAM calls were placed, making up 14.6% of all PCP communications during the 16 months. For all admissions with LAM calls placed, the PCP made a return phone call to the HM team only 0.4% (n = 3) of the time. This resulted in an estimated reduction of 11.1 PCP return phone calls per week (775 total calls) and up to 54 calls saved in 1 week during peak use. We estimated that >30 hours of cumulative call time were saved for both HM providers and PCPs on the basis of

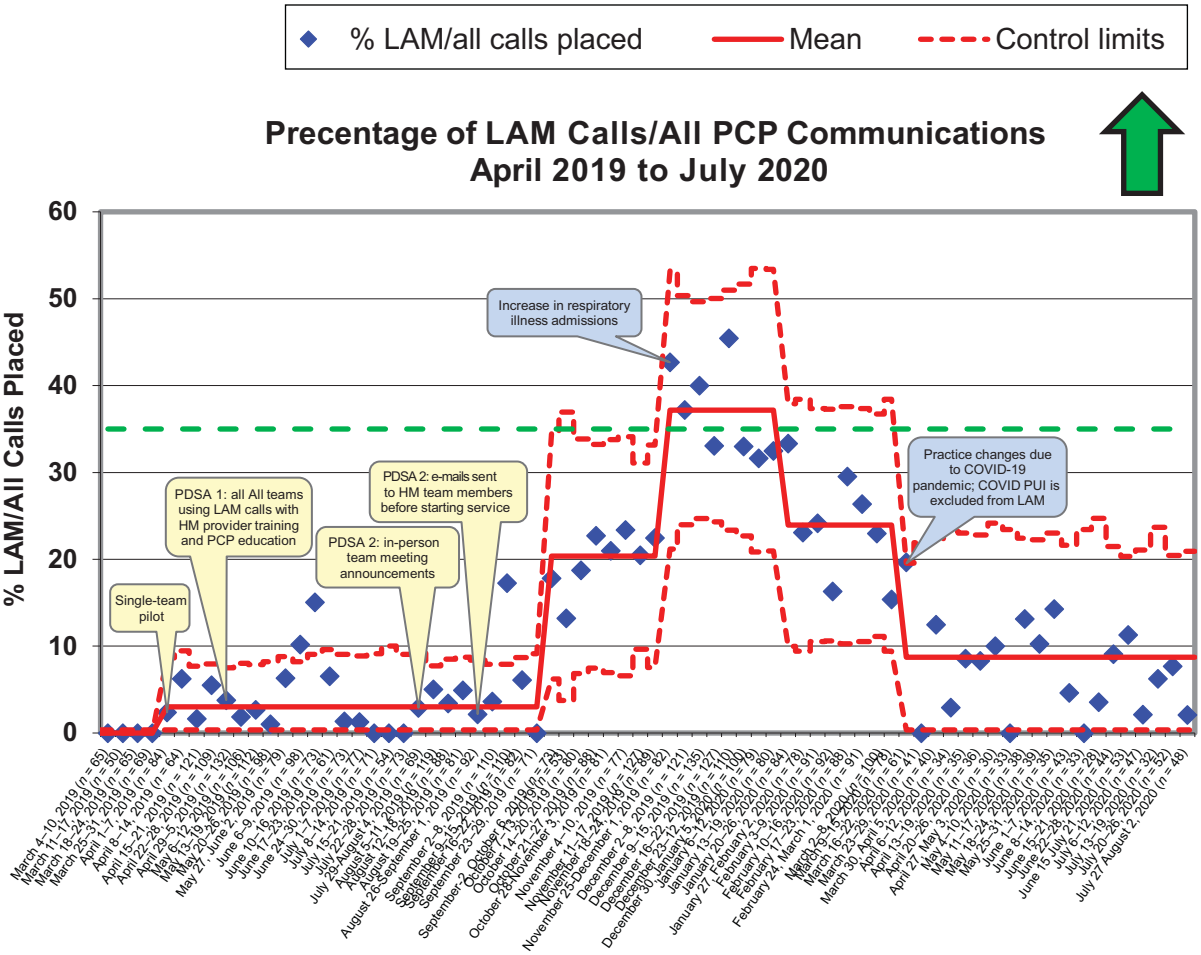

FIGURE 4 LAM call use. A control chart reveals the percentage of LAM calls placed weekly. Yellow boxes denote interventions. Blue boxes denote non-intervention-related special cause variation. The y-axis denotes the number of PCP communications per week. PDSA, plan-do-study-act; PUI, patient under investigation.

average call time at our institution. Only 5.8% (n = 45) of LAM call admissions required an additional 2-way conversation initiated by HM providers to discuss clinical status changes that occurred after the initial LAM was placed. The 7-day readmission rate for patients with LAM calls placed was 3.6% (n = 28), similar to the 3.3% 7-day readmission for all HM patients over this time period.

DISCUSSION

With this project, we sought to maintain reliable communication between inpatient and outpatient providers while improving efficiency and reducing workflow disruptions for providers. We defined a list of common HM admission diagnoses for which 1-way PCP communication was deemed sufficient. With the creation of LAM calls, we were able to increase the number of HM admissions using 1-way communication between HM providers and PCPs. In doing so, we significantly reduced additional phone calls without affecting 7-day readmission rates, suggesting 1-way communication may be adequate for admissions involving the common diagnoses. We purposefully excluded several common admission diagnoses that we felt necessitated direct conversations for coordination of inpatient and follow-up care. These included asthma, which PCPs often primarily manage and should have input on regarding homegoing medication regimens, and neonatal fever, which requires PCP follow-up within 24 hours per our HM division policy.

HM resident and attending physician education was important for the adoption of LAM calls in the standard workflow. We found that in-person and e-mail reminders at the beginning of each resident service month were necessary to increase LAM call use, likely because of the frequent turnover of resident providers. The seasonal effect on LAM call use is likely due to the increased percentage of admissions for viral and respiratory illnesses, namely, bronchiolitis, pneumonia, and influenza. This suggests LAM calls provide an important opportunity to improve communication efficiency for HM providers during times of highest patient volumes.

We saw a significant decrease in LAM call use over the last 6 months of project, coinciding with a decrease in admissions for respiratory illness. Additional decreases in use corresponded with the onset of the COVID-19 pandemic, which required increased communication surrounding infection concerns. Patients admitted with concern for COVID-19 infection were excluded from LAM calls. We also hypothesize that admissions for LAM call diagnoses, particularly those caused by viral illnesses, decreased as a result of social distancing measures. Studies analyzing pediatric hospitalizations during the COVID-19 pandemic found a significant reduction in admission for respiratory illness and a general decrease in admissions for most diagnoses qualifying for LAM calls, supporting our hypothesis.[17,18] Overall PCP communication reliability remained stable during this period, suggesting that HM providers experienced an increased need for 2-way communication. We view this as positive confirmation that HM providers were thoughtful about which patients should qualify for LAM calls and circumstances that require increased communication. Given the data available and the subjective nature of qualifying criteria for LAM calls, we cannot rule out that the low reliability of the LAM call process did not also contribute to this decrease as well.

There were several limitations of this project. We did not track the specific diagnoses that were used for each LAM call and thus could not confirm the diagnoses that led to increased use over the winter months. Our overall PCP call completion, including LAM calls and 2-way communications, was less than our goal of 85% for the majority of the study period. Separate interventions to improve PCP call completion were implemented during this time, potentially secondarily affecting the LAM use rates. Whereas data revealing a small percentage of LAM calls being returned and feedback from PCP representatives supported the effectiveness of LAM calls, no formal feedback on PCP satisfaction was performed. Lastly, we did not evaluate any racial, ethnic, or socioeconomic disparities associated with our work. Important next steps for this work would involve time-motion studies to determine how the implementation of LAM calls has affected provider workflow interruptions, which were not directly measured in this project. In future studies, researchers could also focus on unanticipated issues (eg, increased need for PCP follow-up) with the transition from inpatient to outpatient care that arise with the use of 1-way communication.

We were able to develop a novel process for communication based on PCP feedback that eliminated the requirement for 2-way conversation for uncomplicated admissions for common diagnoses. By creating a 1-way communication system that provides PCPs the option to contact HM providers, we were able to reduce the need for PCP return phone calls for simple qualifying admissions while continuing to provide an opportunity for 2-way communication as deemed necessary by providers.

REFERENCES

1. Berry JG, Hall M, Hall DE, et al. Inpatient growth and resource use in 28 children's hospitals: a longitudinal, multi-institutional study. *JAMA Pediatr*. 2013;167(2):170–177
2. Merenstein D, Egleston B, Diener-West M. Lengths of stay and costs associated with children's hospitals. *Pediatrics*. 2005;115(4):839–844
3. Weigl M, Müller A, Vincent C, Angerer P, Sevdalis N. The association of workflow interruptions and hospital doctors' workload: a prospective observational study. *BMJ Qual Saf*. 2012;21(5):399–407
4. Unaka NI, Herrmann LE, Parker MW, et al. Improving efficiency of pediatric hospital medicine team daily workflow. *Hosp Pediatr*. 2019;9(11):867–873
5. Elliott DJ, Young RS, Brice J, Aguiar R, Kolm P. Effect of hospitalist workload on the quality and efficiency of care. *JAMA Intern Med*. 2014;174(5):786–793

6. O'Leary KJ, Liebovitz DM, Baker DW. How hospitalists spend their time: insights on efficiency and safety. *J Hosp Med.* 2006;1(2):88–93
7. Linzer M, Poplau S, Grossman E, et al. A cluster randomized trial of interventions to improve work conditions and clinician burnout in primary care: results from the Healthy Work Place (HWP) study. *J Gen Intern Med.* 2015;30(8):1105–1111
8. SECTION ON HOSPITAL MEDICINE. Guiding principles for pediatric hospital medicine programs. *Pediatrics.* 2013;132(4): 782–786
9. Forster AJ, Murff HJ, Peterson JF, Gandhi TK, Bates DW. The incidence and severity of adverse events affecting patients after discharge from the hospital. *Ann Intern Med.* 2003;138(3):161–167
10. Weiss L, Cooley A, Orenstein E, et al. Incorporating the voice of community based pediatricians to improve discharge communication. *Pediatr Qual Saf.* 2020;5(4):e332
11. Mussman GM, Vossmeyer MT, Brady PW, Warrick DM, Simmons JM, White CM. Improving the reliability of verbal communication between primary care physicians and pediatric hospitalists at hospital discharge. *J Hosp Med.* 2015;10(9):574–580
12. Zackoff MW, Graham C, Warrick D, et al. Increasing PCP and hospital medicine physician verbal communication during hospital admissions. *Hosp Pediatr.* 2018;8(4):220–226
13. Norton WE, Chambers DA. Unpacking the complexities of de-implementing inappropriate health interventions. *Implement Sci.* 2020;15(1):2
14. Verkerk EW, Tanke MAC, Kool RB, van Dulmen SA, Westert GP. Limit, lean or listen? A typology of low-value care that gives direction in de-implementation. *Int J Qual Health Care.* 2018;30(9):736–739
15. Langley GJ. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance.* 2nd ed. San Francisco, CA: Jossey-Bass; 2009
16. Benneyan JC, Lloyd RC, Plsek PE. Statistical process control as a tool for research and healthcare improvement. *Qual Saf Health Care.* 2003;12(6):458–464
17. Hatoun J, Correa ET, Donahue SMA, Vernacchio L. Social distancing for COVID-19 and diagnoses of other infectious diseases in children. *Pediatrics.* 2020;146(4):e2020006460
18. Wilder JL, Parsons CR, Growdon AS, Toomey SL, Mansbach JM. Pediatric hospitalizations during the COVID-19 pandemic. *Pediatrics.* 2020;146(6): e2020005983