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Using Participatory Design to Engage Physicians in the Development of a Provider-Level Performance Dashboard and Feedback System

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Abstract

Problem Definition: Performance feedback, in which clinicians are given data on select metrics, is widely used in the context of quality improvement. However, there is a lack of practical guidance describing the process of developing performance feedback systems.

Initial Approach: This study took place at the University of California, San Francisco (UCSF) with hospitalist physicians. Participatory design methodology was used to develop a performance dashboard and feedback system. Twenty hospitalist physicians participated in a series of six design sessions and two surveys. Each design session and survey systematically addressed key components of the feedback system, including design, metric selection, data delivery, and incentives. The Capability Opportunity Motivation and Behavior (COM-B) model was then used to identify behavior change interventions to facilitate engagement with the dashboard during a pilot implementation.

Key Insights, Lessons Learned: In regard to performance improvement, physicians preferred collaboration over competition and internal motivation over external incentives. Physicians preferred that the dashboard be used as a tool to aid in clinical practice improvement and not punitively by leadership. Metrics that were clinical or patient-centered were perceived as more meaningful and more likely to motivate behavior change.

Next Steps: The performance dashboard has been introduced to the entire hospitalist group, and evaluation of implementation continues by monitoring engagement and physician attitudes. This will be followed by targeted feedback interventions to attempt to improve performance.

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SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jcjq.2021.10.003.

PROBLEM DEFINITION

Performance feedback, also known as audit and feedback, is widely used in modern health care, often in the context of quality improvement (QI).[1] Clinical performance is measured (audited) and then fed back to practicing clinicians, and often compared to desired performance goals. This feedback is intended to help clinicians better understand and improve the care they deliver, help leadership reduce unwarranted variations in practice, and help groups improve performance on shared priorities.[1,2]

Performance feedback has two major components. The first is the performance report itself, which presents data often derived from the electronic health record (EHR), translated into a relevant metric, and presented as a graphic visualization. This frequently takes the form of a data dashboard,[3] where an individual's data are compared to a pre-specified benchmark, a target, and/or peer data. The second component is the feedback delivery system, which includes how the data report is presented (for example, paper, electronic, face-to-face), frequency of feedback, and performance interventions (for example, education, coaching, incentives, penalties).[4]

Although audit and feedback is considered a critical component of QI, a systematic review found it to be only modestly effective in improving desired behaviors, with a median absolute improvement of 4.3%.[1] Furthermore, there was wide variability in performance improvement, and it is unclear which components of feedback made certain audit and feedback interventions more successful. Consequently, subject experts have stressed the need to study which ingredients of the feedback system work best and how to use this information to guide design and implementation.[5,6] Although suggestions have been made on best practices in designing feedback systems—such as engaging recipients[4,5]—guidance and descriptions of the actual process of designing feedback are lacking.

Our study team was tasked with developing an individual provider feedback system for the University of California, San Francisco (UCSF) Division of Hospital Medicine (DHM), a large academic division with more than 80 core daytime hospitalists who staff two primary general internal medicine services (teaching and nonteaching) at the university hospital. Along with the incorporation of best practices,[4] we felt it would be equally important to develop a feedback system that would be tailored to and embraced by physicians in our division, thus facilitating use and implementation. To accomplish this, we used participatory design methodology. Based on principles of human-centered design, participatory design is a methodology that engages and incorporates end-user feedback throughout the design process, helping ensure that the product supports their goals, fits the organizational context, and engenders positive attitudes toward the technology.[7,8] It is a highly relevant approach to developing tools for clinicians with busy workflows and competing demands on time.[9,10] Tools created using this approach have higher usability, satisfaction, effectiveness, and sustainability.[9-11] Although participatory design has been described in developing feedback reports and dashboards,[11,12] to our knowledge this is the first description of leveraging it to design a comprehensive clinical performance feedback system.

INITIAL APPROACH

Creating a Prototype of a Data Dashboard

We began building our feedback system by prototyping a data dashboard, based on a previously published radargraph design that we found visually appealing and easy to interpret[13,14] (Figure 1). Clinical data for the dashboard are obtained from the EHR, queried using custom structured query language (SQL) scripts, and visualized into the dashboard via R, an open-source programming language for statistical computing and graphics.[15] Specific details about the techniques and process used to create the dashboard with a radargraph design can be found in Appendix 1 (available in online article). The selection of potential initial metrics presented in the dashboard was based on prior and current institutional quality metrics and data report availability, with the intention of adapting or changing these metrics based on feedback from the participatory design sessions.

Physician Recruitment

To recruit physicians to the participatory design sessions, we made several announcements for volunteers by e-mail and during divisionwide meetings. To increase interest, we high-lighted that providers who volunteered would have early access to their individual performance data and the opportunity to affect the development and decisions on individual provider feedback. We made it clear that all feedback was welcome during design sessions, that any information obtained would not be used punitively, and that declining to participate would have no consequences (for these reasons, divisional leadership was purposely excluded from the design sessions). We limited participation to 20 physicians to accommodate multiple clinical schedules and because we felt that a smaller group would allow for richer and more granular discussions.

Participatory Design Sessions and Physician Surveys

In total, 20 physicians volunteered. We scheduled six hour-long design sessions to cover the standard elements of feedback systems, which included (1) dashboard design (covered in the initial session and then throughout the process); (2) and (3) performance metric selection; (4) methods of delivering feedback data; and (5) potential interventions to improve performance on metrics (for example, incentives, coaching).[4] Our sixth and final session served as a summation of the entire design process and included leadership participation (Table 1). We felt that six sessions were sufficient to cover relevant design topics while being sensitive to clinician time and bandwidth. Sessions occurred monthly to allow time to implement changes to the dashboard based on feedback from the prior session.

Although sessions were planned around a specific topic, they were also designed to be flexible and iterative—if a topic needed more time than the session allowed, ongoing discussion was permitted in the following session. This occurred most prominently with metric selection in Sessions 2 and 3. Prior to each session, we reminded participants to review their dashboard and bring their laptop computer to allow them to provide live, real-time feedback. Sessions began with announcements, changes made based on the prior session's feedback, and a quick review of the last session before focusing on the current session's topic. Participatory design sessions were digitally recorded, transcribed, and

independently reviewed by each member of our study team. We then met and came to a group consensus on the key insights from each design session.

In addition to the design sessions, we invited the physician participants to complete two surveys: the first as we commenced the design sessions, and the second after all sessions were complete (Appendix 2). The surveys examined physician attitudes toward each design session topic and their perspectives on the participatory design process. Survey data were summarized using descriptive statistics and used to guide design session discussions, inform the development of the data dashboard, and improve participatory design processes for future initiatives. The study proposal was reviewed and determined to be exempt from Institutional Review Board review by the UCSF Committee on Human Research.

Identifying Barriers to Dashboard Engagement Using the Capability Opportunity Motivation and Behavior (COM-B) Model

After completion of the design sessions, our study team used the Capability Opportunity Motivation and Behavior (COM-B) model,[16] which is based on behavioral change theory, to further inform the pilot implementation of the dashboard. In particular, we identified potential barriers to engagement with the dashboard based on input from the design process and existing published literature,[17-19] and then created relevant interventions to address these barriers based on the COM-B model.[16] We specifically focused on user engagement and adoption of the dashboard, encouraging physicians to regularly access and review their individual performance data. This involved frequent messaging about the user-centered design process, as well as support navigating the dashboard. Details of the COM-B model and associated approaches to facilitate dashboard engagement can be found in Appendix 3.

Resources Allocated

Dedicated financial support went to the principal investigator [S.P.], who was supported with 10% full-time equivalent (FTE) to design and build the initial dashboard prototype, plan and conduct the participatory design sessions, and lead and study implementation of the divisionwide rollout. At least one hour was spent preparing for each monthly design session, one hour conducting each session, and another two hours reviewing and summarizing the session outputs. In addition, the principal investigator facilitated monthly hour-long meetings with the study team. The main technical lead [L.P.] was a clinical informatics fellow who spent 10% FTE effort over six months to build the dashboard. For the technical work, small updates (for example, monthly data updates, minor graphical or design refreshes) took 30 to 60 minutes, while new features (for example, building and incorporating new metrics, major graphical or design changes) could take 8 to 12 hours of dedicated work for each request, which on average occurred quarterly.

The remainder of our study team consisted of three clinical faculty with either QI or service leadership backgrounds, one research faculty with a QI background, and one administrative staff member with QI training who served as the project coordinator. These team members participated on a voluntary basis and were not given dedicated financial support.

KEY INSIGHTS, LESSONS LEARNED

Design Sessions

Key insights from the design sessions are summarized in Table 2, and the final performance dashboard is shown in Figure 2. The lessons learned from the participatory design process highlight the importance of context and local culture when developing a feedback system. Physicians reported that the DHM prides itself on being collaborative and working toward shared priorities and that they felt internally motivated to change behaviors to improve clinical performance when presented with data. They also noted that financial incentives and creating competition between physicians (for example, by explicit ranking) would be experienced as counter to the DHM's culture.

In addition, participants felt that the intent of feedback should be to motivate the receiver toward self-improvement in clinical practice and that individual performance data should not be used punitively. Physicians preferred feedback on metrics that were patient centered, were related to clinical care, and/or addressed disparities in health as opposed to financial or throughput metrics; however, there was an understanding that the latter metrics were often necessary to align with health system or divisional priorities. The final selection of metrics reflected a balance of these priorities (Table 3).

Physician Surveys

The first and second survey response rates were 60.0% and 61.1%, respectively. Survey response rates were affected by physicians arriving late to the first design session due to clinical service responsibilities, preventing them from completion of the survey. The second survey unfortunately coincided with the onset of the COVID-19 pandemic, limiting the effectiveness of survey completion reminders. Detailed survey results can be found in Appendix 2. In summary, physicians were highly interested and receptive to receiving data regarding their own clinical performance. They were motivated to use the performance dashboard and feedback system if it resulted in improved patient care, enhanced clinical competency, and was prioritized by divisional leadership. Survey responses were used to inform design session discussions, including concerns about the accuracy and attribution of data (Session 1), selection and rationale for potential metrics (Sessions 2 and 3), concerns about performance feedback and methods for data delivery (Session 4), and interventions to support motivation and behavior change (Session 5).

Pilot Implementation

By combining principles of feedback from published best practices, such as timeliness, actionability, and target-setting,[1,4] with key insights learned from participatory design processes, we have created a performance dashboard and feedback system designed to meet the needs and preferences of physician users. We introduced the dashboard and feedback system to our entire hospitalist group of 83 core daytime physicians. The initial pilot phase has focused on user engagement and adoption of the dashboard as a clinical tool for individual self-monitoring of performance. Interventions to boost engagement were informed by the COM-B model for implementation, such as encouraging physicians to regularly access and review their individual performance data through frequent, scheduled

messaging during divisional meetings and by e-mail. We highlighted the user-centered design process to improve physician trust and acceptance of the performance dashboard. During presentations at divisional meetings, we have focused on self-guided performance improvement, leveraging the division's strong sense of intrinsic motivation, and provided best-practice tips and access to office hours to demonstrate dashboard navigation and data interpretation. Initial engagement with the dashboard has been encouraging: Of 83 physicians, 34 (41.0%) have accessed and reviewed the dashboard once, 21 (25.3%) twice, 11 (13.3%) three times, and 14 (16.9%) ≥ 4 times.

NEXT STEPS

Following this initial pilot phase, we will continue to identify and address barriers to sustainable engagement with the dashboard. This will include testing push performance reports, in which individual performance data are sent to physicians. We will then introduce active external performance interventions in a tiered, escalating fashion to encourage performance improvement. Coaching will be offered to consistent outliers, with further nonpunitive outreach to individuals by leadership if performance remains low.

Limitations

Our study has some limitations, including that it was conducted at a single academic medical center. Therefore, although the methods of participatory design are generalizable to other settings, participants' perspectives and opinions may not be. Also, to maintain physician confidentiality, we did not link the pre and post surveys, which means we are unable to determine any changes in perspectives. Finally, although the participatory design process identified that inclusion of a metric related to interpreter use for limited English proficient patients was highly favored, current technical challenges abstracting these data from our EHR prevented us from including it in the initial design of our dashboard.

CONCLUSION

We have created a template for the development and implementation of a performance dashboard and feedback system that leverages participatory design methodology to engage physician end users in systematically addressing their concerns, preferences, and priorities. Each health care group will have distinct needs, but the process we have described can provide insights and serve as a guide for designing a provider-level feedback system.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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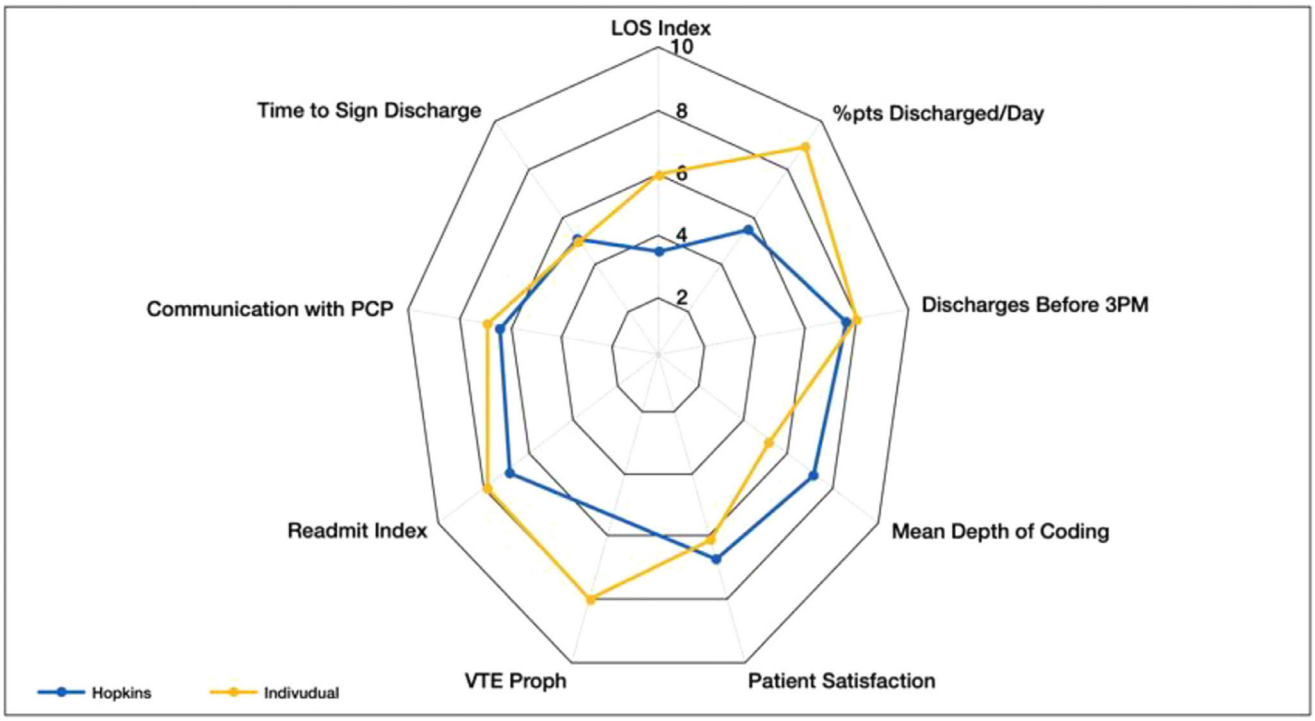

Figure 1:

Shown here is a prototype data dashboard that inspired our dashboard. Provider performance metrics are displayed on a radar graph (or “spiderweb plot”) in yellow, while desired targets are in blue. Data are scaled such that higher values indicate better performance. LOS, length of stay; PCP, primary care physician; VTE, venous thromboembolism.[14]

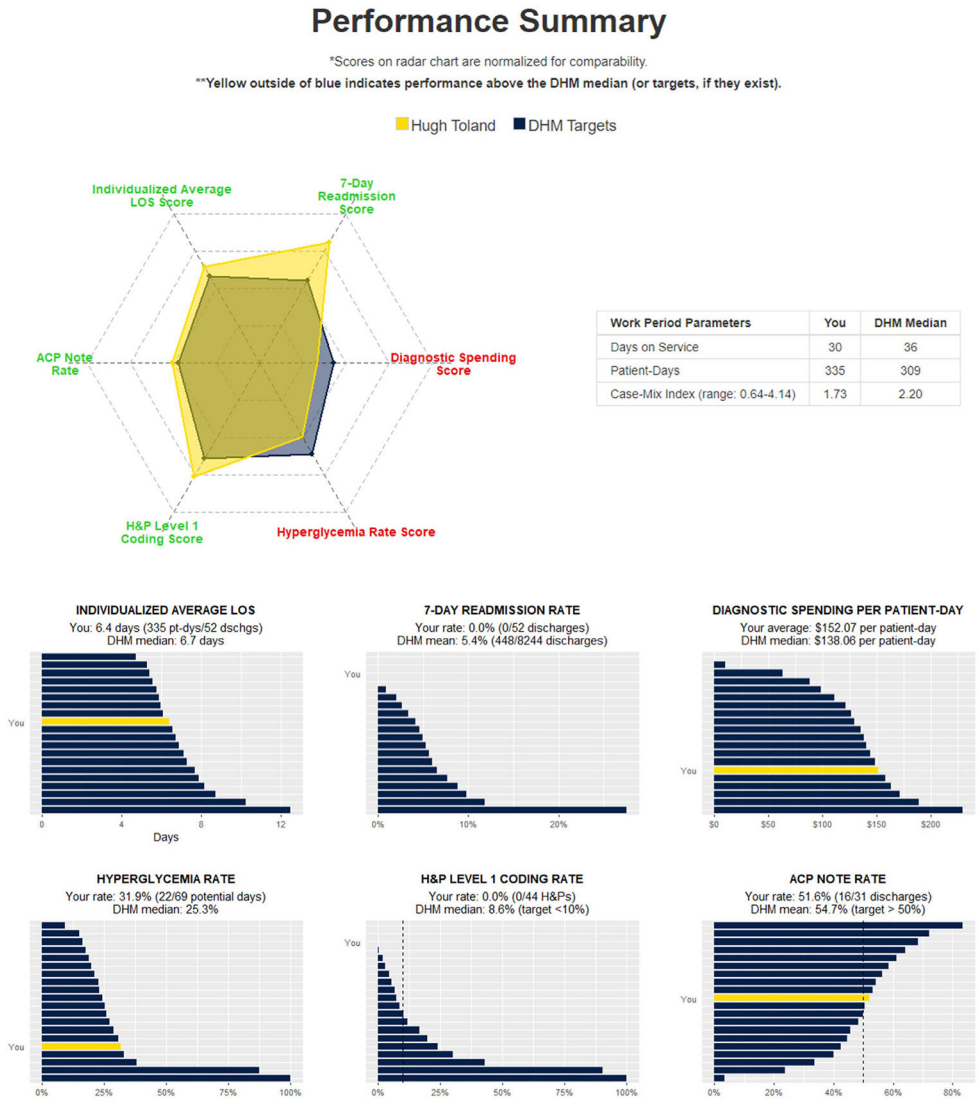

Figure 2:

Shown here is the final performance dashboard based on the participatory design process. Top: Radar graph depicting performance of provider in yellow, compared to divisional targets in blue. Data are scaled such that higher values indicate better performance, and font color indicates if provider is performing better than (green) or worse than (red) desired targets. Bottom: Individual user's performance for each metric is ranked in percentile groups; user's individual performance is highlighted in yellow. DHM, Division of Hospital Medicine; LOS, length of stay; ACP, advanced care planning; H&P, history and physical.

Table 1.

Overview and Content of Participatory Design Sessions for Developing a Feedback Delivery System

Session #1: Introduction to Performance Feedback and Dashboard Prototype

- Introduction to performance feedback, including background and best practices
- Demonstration of initial dashboard prototype
- Users access their own dashboard, review their own data.
  - Ask about initial reaction to seeing own data.
- Solicit group feedback on dashboard design:
  - Ease of interpretation
  - Thoughts on ranking of physicians based on performance
  - Thoughts on creating a “top performers” leaderboard
  - Degree of statistical detail desired
  - Other features desired

Sessions #2 and #3: Quality Metric Selection

- Which domains are most important (for example, clinical, throughput, financial, documentation)?
- How many metrics are desired?
- Brainstorm a metric wish list.
- How should targets for each metric be established?

Session #4: Feedback Delivery

- How should the data report be delivered (electronic, paper, in person)?
- How frequently and when should the data report be delivered?
- Ideal setting for reviewing data—small group, large group, one-on-one?
- How to encourage users to regularly check the dashboard?

Session #5: Performance Interventions

- What would motivate improvement?
- Best approaches to improving performance (for example, education/best-practice tips, self-review, peer vs. content-expert coaching)?
- Best way for divisional leadership to use the dashboard?

Session #6: Wrap-Up, Lessons Learned, Q&A with Leadership

- Summarize design process.

- Present major lessons learned, key takeaways, and changes made based on feedback.
- Obtain final feedback and overall thoughts.
- Conduct question and answer (Q&A) session with leadership to address any concerns participants may have, and allow leadership to explore how they could best use the dashboard.

Table 2.

Developing a Feedback Delivery System: Summary of Physician Feedback from Participatory Design Sessions

Domain	Feedback	Rationale for Feedback	Changes Made in Response to Feedback
Dashboard Design	• Ranking physicians based on performance is unpopular.	• Could undercut collaborative nature of the division.	• Physician performance ranked by groups instead of by individuals (Figure 2). Leaderboard (“Top Performers”) development canceled.
	• Initial reaction to poor performance is shame.	• May lead to disengagement with dashboard.	• Increased messaging that data will not be used punitively and that dashboard was for own personal growth. Implemented “leadership reveals” in which divisional leaders showed their own data to normalize variations in performance.
Metric Selection	• Strong preference for a balance in metric domains. Strongest preference for patient-centered and clinical care metrics. Financial and throughput metrics unpopular but understood as potentially necessary.	• Physicians felt metrics that reflected their clinical performance and patient-centeredness were most meaningful.	• Rebalanced dashboard metrics by adding two clinical metrics and removing one documentation metric (Table 3).
	• Concern about accuracy of performance attribution to individual hospitalist	• Multiple hospitalists often care for the same patient over the course of their hospitalization, thus accuracy of clinical performance attribution felt to be paramount to reliability of data.	• Hospitalizations were divided into patient-days, and attribution was based on the primary attending listed in the electronic health record during a given patient-day—this method of attribution was validated by our study team. Data request feature added to the dashboard to allow physicians to request their patient-level data to assess validity and accuracy.
Feedback Delivery	• Users were checking dashboard only when prompted.	• Many competing demands Dashboard not yet integrated into normal workflow.	• Developed messaging strategy to increase engagement—regularly scheduled reminder e-mails and announcements, embedding the link into divisional websites and service-related e-mails.
	• Digital delivery (e-mail) was preferred over in-person or group review.		• E-mail will be initial mode of feedback delivery.
Performance Interventions	• Intrinsic motivation likely enough to affect change. Financial incentives unpopular.	• Intrinsic motivation felt to be core divisional characteristic.	• Led to initial focus on performance interventions to increase engagement (see above) rather than change performance.
	• Group/shared priorities valued.	• Collaboration felt to be a core divisional value.	• Increased alignment of individual-level metrics to divisional and health system metrics (Table 3).

Domain	Feedback	Rationale for Feedback	Changes Made in Response to Feedback
	• If underperforming, would prefer the opportunity and time to improve on own before being approached for coaching.	• Leverages intrinsic motivation, allows opportunity for self-growth, avoids feelings of initial shame.	• Initial performance intervention will allow users to improve on their own.
	• Actionable guidance (for example, best-practice tips) on how to improve performance on a given metric desired.		• Best-practice guidance and metric champions will be implemented. Leadership aware; individual data will not be accessible to leadership during initial rollout.
	• Preference for leadership to not use individual data for remediation.	• Dashboard felt to be more useful as a tool for self-improvement; using punitively may breach trust.	

Table 3.

Final Metric Selection for Inclusion in Data Dashboard Based on Participatory Design Process

Metric	Description	Domain	Metric Alignment
Length of stay	Individualized length of stay	Throughput	Health system priority
H&P Level 1 coding rate	Percentage of H&Ps coded as Level 1 (low complexity) by the billing department	Financial	Divisional priority
Diagnostic spending	Average daily spending on diagnostic tests (laboratory, microbiology, and imaging)	Value	Health system priority
Hyperglycemia rate	Percentage of days worked with ≥ 2 point-of-care glucose checks showing hyperglycemia	Clinical care	Participatory design group's request for a clinical metric
7-day readmission rate	Percentage of discharged patients readmitted to [site name] within 7 days	Clinical care	Divisional priority Participatory design group's request for a clinical metric
Advanced care planning (ACP) note rate	Percentage of discharged patients with advanced age or comorbidity who had an ACP note completed during their admission	Clinical care	Participatory design group's request for a patient-centered metric Divisional priority

H&P, history and physical.

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