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“I Had No Idea This Happened”: Electronic Feedback on Clinical Reasoning for Hospitalists



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ABSTRACT

BACKGROUND: Feedback on the diagnostic process has been proposed as a method of improving clinical reasoning and reducing diagnostic errors. Barriers to the delivery and receipt of feedback include time constraints and negative reactions. Given the shift toward asynchronous, digital communication, it is possible that electronic feedback (“e-feedback”) could overcome these barriers.

OBJECTIVES: We developed an e-feedback system for hospitalists around episodes of care escalation (transfers to ICU and rapid responses). The intervention was evaluated by measuring hospitalists’ satisfaction with e-feedback and commitment to change.

DESIGN: A qualitative survey study conducted at one academic medical center from February to June 2023.

PARTICIPANTS: Hospitalists — physicians and advanced practice providers.

APPROACH: Two hospitalists, one internal medicine resident, and a nurse reviewed escalations of care on the hospitalist service each week using the Revised Safer Dx framework. Confidential feedback was emailed to the hospitalists involved in the patient’s care. Hospitalists were asked to rate and explain their satisfaction with the e-feedback and whether they might modify their clinical practice based on the e-feedback. The open-ended text comments from the hospitalists were analyzed using a thematic analysis framework.

RESULTS: Forty-nine out of fifty-eight hospitalists agreed to participate. One hundred five out of one hundred twenty-four (85%) e-feedback surveys that were sent were returned by the hospitalists. Hospitalists were highly satisfied with 67% ($n = 70$) of the e-feedback reports, moderately satisfied with 23% ($n = 24$), and not satisfied with 10% ($n = 11$). Six themes were identified based on analysis of the comments. Themes related to satisfaction with the intervention included appreciation

for learning about patient outcomes, general appreciation of feedback on clinical care, and importance of detailed and specific feedback. Themes related to changing clinical practice included reflection on clinical decision-making, value of new insights, and anticipated future behavior change.

CONCLUSIONS: E-feedback was well received by hospitalists. Their perspectives offer useful insights for enhancing electronic feedback interventions.

KEY WORDS: hospital medicine; diagnostic errors; feedback; clinical reasoning

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INTRODUCTION

There are more than 250,000 diagnostic errors each year in hospitals in the United States¹ with approximately 10% of these leading to adverse events and some culminating in death.² Studies have demonstrated that most diagnostic errors in hospitals result from failures in clinical reasoning including inaccurate history and physical examination, imprecise test ordering and interpretation, and insufficient knowledge.^{3,4} Initiatives that improve clinical reasoning skills have the potential to reduce diagnostic errors.^{3,4}

One method to improve clinical reasoning is by providing feedback about a clinician’s diagnostic performance during patient care.^{5–7} Feedback on diagnostic and treatment decisions can be used for learning and practice improvement.^{8,9} This approach is essential for medical students and resident physicians to improve their clinical reasoning.^{10,11} However, very little feedback occurs during independent practice.^{7,12} Contributing factors include negative emotions associated with receiving feedback such as feeling judged with reputational risks,^{9,13} time constraints, and inadequate systems for obtaining meaningful data.¹⁴ A national survey of pediatric

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hospitalists reported that the greatest barriers to peer-to-peer feedback were time and discomfort.¹⁵

Asynchronous, confidential, and bidirectional electronic feedback (“e-feedback”) could overcome some of these barriers. Despite increasing on-line learning and electronic communication,^{16,17} how clinicians would respond to and learn from e-feedback is unknown. Escalations in care of hospitalized patients (such as transfer to the intensive care units [ICUs] or initiation of rapid response/code blue activation) are high-stakes and cognitively complex events that provide an opportunity to evaluate the clinical reasoning process and examine how clinicians’ respond to e-feedback.^{9,18} Evaluating such events may illuminate the underlying clinical reasoning process and help understand how certain escalations can be prevented while others contribute to improved patient care.¹⁹

We developed an e-feedback system around episodes of escalation of care and examined hospitalists’ satisfaction with the e-feedback and intention to modify their clinical practice based on the e-feedback. Learning how clinicians respond to e-feedback and whether such information is useful could help design interventions to improve clinical reasoning in other settings.

METHODS

Study Design, Participants, and Setting

This study examined responses to e-feedback on clinical care using a cross-sectional survey at the Johns Hopkins Bayview Medical Center in Baltimore, MD, from February to June 2023. The participants were adult hospitalists (physicians and advanced practice providers (APPs)). Participation was voluntary. The study was advertised to all hospitalists during the hospital medicine division meetings and by emails. We measured hospitalists’ satisfaction rate (highly satisfied, moderately satisfied, not satisfied) with the e-feedback communication, and we performed a qualitative analysis of the open-ended questions to ascertain hospitalists’ reactions to e-feedback. Questions were posted at the end of the e-feedback communication; hospitalists responded by typing the answers. With this method, we hoped to gather rich and complex accounts of the hospitalists’ subjective experiences and practices.²⁰ The study was approved by the Johns Hopkins Medicine Institutional Review Board.

Theoretical Framework

Situated cognition theory posits that clinical reasoning is a product of the interaction between the clinician, patient, and healthcare team in a specific practice setting.²¹ This theory is well suited to examine clinical reasoning in real-world settings²² where there are multiple paths to a successful outcome and multiple acceptable outcomes for a given process (nonlinear phenomena).²³ Qualitative methods are

well suited to evaluate nonlinearity and clinical reasoning in the real world.^{21,23} Therefore, we chose a qualitative study design based on a constructivist paradigm which considers reality as multiple, subjective, and related to how individuals understand and create their own meanings influenced by specific social contexts.^{24,25}

Identification of Cases and Data Extraction

One hundred sixty-eight patient records were flagged for review by the analytics team if they met the inclusion criteria for our study. The following patients with escalations of care were flagged: any adult patient (≥ 18 years) who was admitted to the general medicine hospitalist service and then had a transfer to the ICU and/or intermediate care units (IMC), a rapid response/code blue activated, or a death. Records that were flagged by the analytics team and did not meet the inclusion criteria after review by a clinician (SK) were excluded (patients were excluded if the transfer to the ICU or IMC was routine (e.g., for drug administration/monitoring, after a surgical procedure for monitoring), or if the patient was receiving palliative or hospice care). Sixty-five patient records met the inclusion criteria.

Each record was reviewed by all members of the core team (two hospitalists, one senior internal medicine resident, and one clinical nurse) using the Revised Safer Dx Instrument which systematically assesses the diagnostic process by considering the documented history, physical examination, tests ordered/interpreted, consultations sought, and clinical reasoning elaborated in the electronic health record (EHR),²⁶ which was part of the Epic Systems.²⁷ Clinicians had the option of drafting their notes using free text or a template with click selection of pre-populated text. For each patient record, the team discussed and came to consensus on their interpretation of the clinical reasoning around the time of the escalation of care. A summary of the team’s analysis based on the Revised Safer Dx framework was prepared for e-feedback communication. Before the study began, the core team pilot-tested their approach using the Revised Safer Dx instrument on 5 patient records to reach consensus on the content and style of the e-feedback. During the pilot testing, hospitalists provided suggestions on the e-feedback which led to iterative enhancement of the process.

Intervention

Within 1 week of the escalation of care, the e-feedback and teaching points pertaining to the case were emailed via RED-Cap® to the hospitalists who were involved in the patient’s care in the previous 72 h. The e-feedback was formative, confidential, and specific.^{12,28} The e-feedback form is shown as Fig. 1. An example of an e-feedback communication with a participant is provided in Appendix 1.

<i>E-Feedback Form</i>	
Patient Name:	Medical Record #:
Date Admitted:	Date of Care Escalation:
Floor Course:	
Prompt for Escalation in Care:	
ICU/IMC/Rapid Response Course:	
Key Feedback Message to Participant	
Nursing Insight:	Review using Safer Dx:
For Participating Hospitalist to Answer	
Are you satisfied with the feedback/information given to you?	
<input type="checkbox"/> Not satisfied <input type="checkbox"/> Moderately satisfied <input type="checkbox"/> Highly satisfied	
Please let us know why you are satisfied or dissatisfied:	
Please list 1-2 things you may do differently in the future while caring for patients based on the information we shared:	

Figure 1 E-feedback form.

Data Collection

Participants were able to respond to each episode of e-feedback via REDCap®. They were asked (i) to rate their satisfaction with e-feedback (scale with options for highly satisfied, moderately satisfied, not satisfied), (ii) to explain reasoning for satisfaction/dissatisfaction (open-text field), and (iii) describe if they would do anything different when caring for similar patients in the future (open-text field).

Reminder emails were sent to the participants after 2 and 5 days. The REDCap® surveys were not anonymous since they were linked to an event and provider. The same participant could have been involved in multiple patient care escalations during the study period, and therefore, may have received multiple e-feedback communications and completed multiple, unique e-feedback reports.

Data Analysis

The open-ended text provided by hospitalists was de-identified and analyzed using a thematic analysis framework.^{29,30} Two coders (SK and SMG) reviewed 40% of the text responses to develop the initial coding framework via inductive open coding. Codes from the open coding list were merged based on similarities and differences to create the initial codebook. Multiple iterations of the codebook were created through the coding of text responses and subsequent reflection and discussion by the two coders. The two

coders then independently applied codes to all open-ended responses (SK in Word and SMG in ATLAS.ti software); discrepancies were resolved by SMG to ensure coder agreement. Codes were aggregated into themes to tell a coherent story based on the data.

Reflexivity

Reflexivity is a collaborative practice in which researchers examine the impact of subjectivity and context on their methods.³¹ We researched this topic due to our mutual interests in feedback and clinical reasoning. All authors except SMG are clinicians. The analysis was primarily performed by SK (a hospitalist with a master's degree in the health professions education) and SMG (a PhD trained qualitative researcher). All authors reviewed the analytical findings and we had team meetings to discuss how our own assumptions influenced data interpretation. SMW and GD were not directly involved in the e-feedback process and helped conceptualize the evaluation of the intervention based on their experience in clinical reasoning, medical education, and practice improvement initiatives.

RESULTS

A total of 49/58 (84%) adult hospitalists agreed to participate in the study. Forty-nine percent ($n = 24$) were female, 22% ($n = 11$) were APPs, and 78% ($n = 38$) were physicians.

Of the 49 hospitalists who agreed to participate, 43 were involved in the care of at least one patient with escalation of care and thus received e-feedback. A total of 124 e-feedback communications (each with a survey) were sent to these 43 hospitalists (physician and/or APPs). For each patient record reviewed, multiple clinicians received e-feedback communication. Thirty hospitalists were involved in multiple escalations and therefore received more than 1 e-feedback communication with a survey. One hundred five surveys were returned (response rate 85%). Sixty out of sixty-five (92%) of the care escalations were transferred to the ICU or IMC and 5/65 (8%) were rapid responses that did not require ICU/IMC transfers. The indications for the escalations in care are shown in Appendix 2. Hospitalists were highly satisfied with 67% ($n = 70$) of e-feedback reports, moderately satisfied with 23% ($n = 24$) of e-feedback reports, and not satisfied with 10% ($n = 11$) of e-feedback reports.

Thematic analysis of open-ended comments identified six themes. These themes are described below in detail with representative quotes.

In response to the inquiry about satisfaction/dissatisfaction with e-feedback, the participants expressed appreciation for learning about patient outcomes, reported general appreciation of feedback on clinical care, and highlighted the importance of detailed and specific feedback.

Appreciation for Learning About Patient Outcomes

Participants described how knowing what happened to the patient's clinical course was helpful. Most participants noted that they had not known about the patient's clinical trajectory after leaving their care: "I only managed the patient briefly during his transit from floor>IMC>ICU so hearing input after the unfortunate trajectory and clinical picture was clearer is helpful." "It is very helpful to hear of this patient's course. I was not aware of the ultimate management and also the clinic follow-up." Participants also expressed emotions toward these outcomes: "I am very sad that the patient passed." "I'm sad that he had a long and eventful course and arrested. He looked very good the night I saw him." This included positive emotions: "Happy to see subsequent course. Thank you so much for the update about the condition of this patient. This is very helpful."

General Appreciation of Feedback on Clinical Care

Many participants described their appreciation for receiving the e-feedback. Specifically, they commented on the feedback being constructive and educational: "I appreciate the information and references provided for this encounter." "The details provided and feedback are great. I really appreciate that educational point." "It is helpful to receive feedback as an attending, I feel like this rarely happens in a

constructive way and as a new attending I am always wanting to improve."

Importance of Detailed and Specific Feedback

Hospitalists commented on the specificity of the feedback and the inclusion of multiple perspectives on aspects of care. For example, one hospitalist noted the level of in-depth information in the feedback and importance of including a nurse's concerns about patient care: "This summary provides detailed and relevant information as well as the nurse's perspective of the circumstances surrounding this patient's upgrade. ...It is informative and helpful to know the nurse's concerns as well." Another participant reported: "It is helpful to have a case reviewed to understand components of the care including medical assessment, documentation, and care coordination that are appropriate or could be improved." Among participants who were less satisfied, there was a desire for more specificity such as evidence pertaining to recommendations in the feedback, "Feedback could include insight into whether Narcan should have been administered or not." "I'm less satisfied that the comments don't go into the level of evidence or controversy about routine use of antiepileptics in these subarachnoid hemorrhage situations."

In describing the impact of e-feedback on hospitalists' clinical practice, participants reflected on their clinical decision-making, recognized the value of new insights, and anticipated future behavior change.

Reflection on Clinical Decision-Making

Hospitalists' reflection on the diagnostic process prompted by e-feedback came in three forms:

- (1) Agreement with the e-feedback: most hospitalists generally agreed with e-feedback if subsequent events aligned with e-feedback. "Agree with overtreatment of UTIs in elderly (with follow up urine culture showing no bacteria)." "I agree I think I should have stopped DOAC (given patient subsequently developing GI bleeding)."
- (2) Disagreement with the e-feedback: some hospitalists disagreed with e-feedback even when subsequent events did not support their initial thought process. For example, one hospitalist disagreed that a patient had asymptomatic bacteriuria rather than a urinary tract infection (even though final urine culture did not show any bacteria) and justified why treatment was needed during the acute setting. "Based on RRT note, urine was extremely milky/cloudy. Given leukocytosis, history of neurogenic bladder and self-catheterization with mild elevation in lactate, urine appearance prompted treatment."

- (3) Uncertainty about the e-feedback: some hospitalists noted that the e-feedback did not clarify best practices in the situation or general principles to carry forward. “I am still somewhat unclear on whether it would have been appropriate to administer the medication or what a universal guideline would say.”

Value of New Insights

Participants described new insights from the e-feedback pertaining to clinical care. Several comments highlight specific lessons learned based on the e-feedback: “Good to review his case and learned about use of HFNC in hypoxic patient secondary to pneumonia.” “Hypervolemic hypernatremia is a new learning point for me from this case. Apparently, hypervolemic hypernatremia is the most common etiology in the ICU: <https://pubmed.ncbi.nlm.nih.gov/26377488/>.” “This review sheds some light on how the patient ended up in a situation to develop ischemia while on apixaban.” A hospitalist described the need to be thoughtful, use data judiciously to help with the clinical exam, and not rely solely on other physicians’ assessments: “I need to more thoroughly review JVP, weights, imaging to help determine fluid status. And not overly rely on volume assessment done by renal (consultants).” Another participant pointed to how they will use the feedback in their own teaching, “I will be using the teaching pearls with my fellows and students.”

Anticipated Future Behavior Change

Hospitalist participants described four orientations toward practice change in response to e-feedback:

- (1) No change: Participants would be less amenable to change if they thought they were not directly involved in the patient’s care (“It does not pertain to me ...”), if there was alignment between e-feedback and their decision-making (“There were no specific actions that could have been done differently”), or if they did not agree with e-feedback (“... I don’t think it would be appropriate to explore other causes of bradycardia.”).
- (2) Some change: Hospitalists were open to ideas and insights they generated based on e-feedback. For example, a hospitalist described how to use the electronic health record to identify the sickest patients on their list: “An acuity/decompensation risk score could be used to help rounders identify the sickest patients, so that they could see them first.” Another hospitalist advocated for improved communication: “Better communication between teams upon transitions of care could have prevented the upgrade.” Some described specific changes related to patient care: “Hunt more conscientiously for blocked P waves in patients with sinus bradycardia.” “Document differentials.”
- (3) Uncertain about change: A hospitalist who was unaware of additional data during an encounter wrote: “Not sure what I can do differently. Maybe updating history at another time when she was more alert would have been beneficial.”
- (4) Challenges to change: Some hospitalists’ comments highlighted contextual issues related to the specific case that would make changing their practice in the future challenging. These issues related to patient cognition (“I think timely assessment of chest pain is key. This is difficult in patients with dementia.”), patients’ location in the hospital (“Medicine boarder’s management in ED can be challenging, especially timing of medications.”), and being new on service and not knowing the patient or family (“Reach out to family even sooner, but also this patient was new on my list.”).

DISCUSSION

After an e-feedback intervention to advance hospitalists’ clinical reasoning, we found that most participants were highly satisfied with the content and process. The themes generated suggest the reasons for their satisfaction or dissatisfaction with e-feedback and why they would or would not consider changing their clinical practice.

Clinicians need effective feedback systems to reduce harms from errors related to faulty clinical reasoning.⁷ Studies have shown that clinicians are generally less comfortable discussing clinical reasoning errors in public venues like morbidity and mortality conferences compared to private conversations.¹³ In public settings, clinicians are often fearful of the negative consequences of challenging peers.³² Loss of reputation is also cited as a barrier to discussing clinical reasoning errors.^{13,33} Most participants in our study were satisfied with the e-feedback communication. This may have been because the e-feedback was confidential, specific, timely, and nonpunitive.^{12,34} Our participants described appreciation when the e-feedback content was detailed, had specific follow-up information about patients’ clinical course, was constructive, and included educational points. Aspects of the e-feedback that contributed to participants’ dissatisfaction included a lack of discussion about the controversies surrounding recommendations. Currently there is insufficient evidence to provide guidance on giving clinicians feedback on their clinical reasoning;⁶ however, the findings from our study can serve as a basis for refining future e-feedback systems.

Bowen et al. identified the types of changes internal medicine physicians might make to their clinical practice based on feedback: general rules (confirming feedback that would reinforce the clinician’s approach to patient care or disconfirming feedback that would lead to remediation strategies), conditional rules that they would apply to similar patient cases or broadly to other patients, and decisions to

not change practice in the future.⁹ In that study, the clinicians were asked to reflect on a memorable case whereas in our study the participants reflected on a patient case from the past week and had summary data provided as an adjunct to their memory. The participants in our study described similar patterns as the physicians in the Bowen et al. study, such as general lessons they would apply for future identical patient cases (“consider the history of small bowel function and surgery in the choice of anticoagulants”) and more broadly in medicine (“think of uncommon situations”). In our study, most hospitalists expressed agreement with e-feedback if subsequent events aligned with the content of the feedback, including the educational points. However, some disagreed even if follow-up patient data did not support their clinical decision-making in retrospect. For the latter instances, hospitalists stated they would not change their future clinical practice based on e-feedback.

What feedback clinicians choose to incorporate in practice depends on multiple factors related to the clinician (emotions, knowledge about standard of care/evidence), the patient (cognitive status, clinical course), and the environment (rapidly changing time pressured scenarios, incomplete data, and uncertainty).²¹ How clinicians make sense of feedback may be related to “specialty-specific” cultures.³⁵ In a study of surgery and intensive care medicine trainees, the surgeons could readily incorporate feedback on operative skills whereas the intensivists found it challenging to make sense of feedback in an uncertain practice environment without reliable correlations between patient outcomes and clinical performance.³⁵ Hospital medicine is similar to intensive care, and future research should assess how specialty-specific culture influences hospitalists’ meaning-making of feedback.

Several limitations of this study should be considered. First, we studied hospitalists’ experience with e-feedback at a single academic medical center and the insights obtained may not align with hospitalists in other settings. We have provided details about the context, participants, and the intervention; these details would help hospitalists elsewhere make a judgement about transferability of the findings to their clinical practice.³⁶ Second, the e-feedback intervention was only applied to the care escalations which are a fraction of the clinical decisions and events that clinicians contend with. Third, a single reviewer made the final decision regarding inclusion of patient records for the e-feedback intervention; group review may have led to the inclusion of additional records. Fourth, even though the e-feedback communication and participants’ responses were collected within 1 week after the care escalation, some of the responses may have been affected by recall bias. Fifth, since hospitalists’ responses to e-feedback were not anonymized, social desirability may have led to more favorable satisfaction rates. Sixth, we chose open-ended survey responses to answer our research questions, and replies to such queries are sometimes

brief. While such responses do not always reveal context and nuance, the summation of brief and detailed responses is sufficient to gain new insights and generate hypotheses. Seventh, a team of four clinicians were available to review cases and provide e-feedback. This may pose barriers to adoption in other centers that have decreased staffing availability. Finally, given our cross-sectional study design, we are not able to assess whether participants subsequently changed their clinical practice and whether there were any improvements on clinical reasoning outcome measures. Future studies are needed to assess these aspects.

In conclusion, our e-feedback intervention on the clinical reasoning of hospitalists was well received. Most hospitalists were appreciative of the e-feedback as they noted a lack of clinical feedback on their work since having completed training. E-feedback is scalable as it can be delivered digitally, is asynchronous, can be reviewed quickly by recipients, and be embedded in clinical work. Future artificial intelligence applications may be able to automate e-feedback for all clinicians.³⁷ Practicing clinicians learn more from their patient care experiences rather than programmed learning in formal settings;³⁸ future studies should assess if such interventions improve clinical reasoning of hospitalists and ultimately patient outcomes.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s11606-024-09058-1>.

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Declarations:

Ethical Approval: The Johns Hopkins Medicine Institutional Review Board (JHM IRB). Number, IRB00345899. IRB Committee, IRB-X.

Conflict of Interest: The authors declare that they do not have a conflict of interest.

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