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“Closing the Loop”: a Mixed Methods Study about Resident Learning from Outcome Feedback After Patient Handoffs

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Abstract

Background: Learning patient outcomes is recognized as crucial for ongoing refinement of clinical decision-making, but is often difficult in fragmented care with frequent handoffs. Data on resident habits of seeking outcome feedback after handoffs is lacking.

Methods: We performed a mixed-methods study including 1) an analysis of chart re-access rates after handoffs performed using access logs of the electronic health record; and 2) a web-based survey sent to internal medicine and emergency medicine residents about their habits of and barriers to learning the outcomes of patients after they have handed them off to other teams.

Results: Residents on ward rotations were often able to re-access charts of patients after handoffs, but those on emergency medicine or night admitting rotations did so <5% of the time. Among residents surveyed, only a minority stated that they frequently find out the outcomes of patients they have handed off, although learning outcomes was important to both their education and job satisfaction. Most were not satisfied with current systems of learning outcomes

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Other Disclosures

None

Ethical Approval

This study had IRB approval at the University of California, San Diego.

Disclaimers

None

Previous Presentations

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of patients after handoffs, citing too little time and lack of reliable patient tracking systems as the main barriers.

Conclusion: Despite perceived importance of learning outcomes after handoffs, residents cite difficulty with obtaining such information. Systematically providing feedback on patient outcomes would meet a recognized need among physicians in training.

Introduction

Learning from patients' outcomes after management decisions is a crucial component of developing clinical skills in physicians in training.(1, 2) This outcome feedback, defined by Lavoie as "the natural process of finding out what happens to one's patients after their evaluation and treatment,"(3) is recognized as important for ongoing calibration of decision-making processes.(1, 4) In this context, we use the definition of calibration used by Croskerry—"the accuracy of an individual's probability assessments." (1) Medical education research has shown that much diagnostic expertise comes from recalling previous patients and knowledge about diseases, their context, and consequences,(5) which helps organize and reinforce clinical concepts.(6) Critical elements of learning involve deliberate practice with contemplation of multiple examples,(7) and resident physicians may be the most in need of outcome feedback.(8) However, many make initial assessments and treatment plans for newly-admitted patients, only to hand care of those patients off to other teams.(9, 10) These handoffs create significant barriers to learning the outcomes of those clinical actions. This is especially true because diagnoses often change between admission and discharge(11) and can also change post-discharge. With increased fragmentation of care, much modern management is more of a non-feedback-controlled or "open-loop" system.(12) Patient outcomes that are unknown maintain a decision-making schema the same way as if the outcomes are known to be favorable or consistent with expectations.(1) In these settings, a clinician's faulty schema is more likely to be reinforced by self-confirming confidence than it is to be corrected.(2, 4) This concern has been discussed in the arena of diagnostic decision-making, as it is understood that diagnostic expertise is gained by learning from previous patients(13, 14, 15) and that simple follow-up provides the opportunity to learn from mistakes.(16) These potential learning opportunities were illustrated in a study about causes of unplanned presentations to the healthcare system after clinic visits.(17) While important for diagnostic decision-making, this feedback is also applicable to therapeutic management of conditions.

In current healthcare delivery models, outcome feedback for physicians is typically haphazard and unreliable—often relying on casual contact with colleagues who saw the outcome.(1, 12) Limited time is one of the main reasons cited for the lack of learning from patient outcomes. However, there are several other barriers to provision of feedback, ranging from incomplete awareness of the importance of feedback to broad breakdowns in communication.(1) Often, if physicians want to find out about the outcomes of patients they saw in the past, they must find their own methods to track the patients and their own time to do so. While some raise ethical concerns of privacy of patients' health information, the authors of one commentary discussed that the benefits of this practice likely outweigh potential harms.(19)

A survey on Canadian emergency medicine residents and program directors found that the perceived educational value of outcome feedback is high, and residents would like it to be a required component of their training.(22) Internal medicine residents and hospitalists showed in a qualitative study that following up clinical outcomes is sometimes occurring, prompted by curiosity, concern for the patient, and clinical uncertainty.(23) However, this outcome feedback is rare. A prior survey on emergency physicians in Canada(24) found that 97.3% would like to have more outcome feedback, and over 95% said that it would help improve diagnostic accuracy, treatment outcomes, as well as their job satisfaction. A review(3) found that the systems for outcome feedback for emergency medicine (EM) residents have been increasingly available over the last few decades, but they are perceived as inadequate and the majority are dissatisfied with their amount of outcome feedback and desire improvement. These deficits in outcome feedback have not been studied across internal and emergency medicine, particularly among residents, and further studies analyzing perceptions and habits are warranted.(3)

In this study, we sought to evaluate current practices among IM and EM residents of follow-up of post-handoff patient outcomes, quantifying how often follow-up occurred, the perceived value of these behaviors and barriers to obtaining feedback. We performed a mixed-methods study that involved analysis of electronic health record (EHR) access logs and administration of a survey to IM and EM residents to gather qualitative and quantitative data about the frequency of post-handoff outcome feedback and factors associated with why it may not be easily obtained.

Materials and Methods

Setting

We performed our study at a 563-bed academic medical center in San Diego, CA. At the onset of the study, the medical center had had a comprehensive commercial EHR (Epic; Verona, Wisconsin) in place in the outpatient setting for years and in the inpatient setting for 22 months. The ED had a separate locally-developed EHR that was in place for many years. Clinical documentation in these systems was almost entirely electronic, although patients had physical charts that could include some local data (e.g., ECGs, telemetry strips, etc.) and paper records from external sources. The study protocol for this mixed-methods study involving a web-based survey and quantitative analysis of EHR access logs was approved by the Institutional Review Board at the University of California, San Diego.

Electronic chart re-access

In a separate part of this study, we performed a cross-sectional study of EM and IM resident electronic chart re-access after handoffs from December 16, 2012 through June 7, 2013. We sought consent from all EM and IM residents during resident conferences and individual meetings.

Our primary outcome was resident re-access to any section of the electronic chart of hospitalized patients within 14 days of that resident's last handoff of the patient's care during the encounter. This re-access was identified using the time-stamped access log within

our electronic health record. We identified handoffs by determining when residents' assignments on patient treatment teams were discontinued. This could occur when care was transferred to another physician or when the patient was discharged from the hospital. Multiple handoffs could occur in each encounter.

We recorded resident department and the type of clinical rotation at the time of handoff (ED, daytime wards, overnight admitting, cross-covering, ICU, cardiovascular, or other). Both of these variables were included because EM residents would also rotate in the ICU or on electives and IM residents would rotate in the ED. We also recorded potential effect modifiers, including resident characteristics (year of training and gender), patient characteristics (age, gender and ethnicity), and encounter characteristics (initial level of care, whether the handoff occurred off-hours and whether diagnostic tests were pending at the time of handoff). "Off-hours" was defined as occurring outside of Monday through Friday from 6am to 7pm.

We created descriptive statistics of the re-access events and fit a multivariate logistic regression model to identify potential predictors of chart re-access by residents. The analysis of re-access was performed using SAS, version 9.4 (SAS Institute, Inc., Cary, NC).

Survey of residents

Using a web-based service(25), we performed a survey of current residents at our institution in internal medicine (IM, n=114, including those in combined programs and preliminary interns) and emergency medicine (EM, n=35), for a total of 149 potential respondents. The group invited to participate in the survey had substantial, but not complete overlap with those invited to participate in the re-access study as the two aspects of the study were conducted in two sequential academic years. To evaluate the hypothesis that there was significant variation of follow-up practices among residents, a survey was designed to evaluate current practices residents use to follow up on patients post-handoff and how important this follow-up is to their educational and professional experience. Items related to methods of follow-up and impact on professional satisfaction were motivated by Lavoie's prior work in the area (24) and modified to apply to general inpatient settings. Additional items were included to identify specific barriers to obtaining feedback. This survey was administered in May 2014, so the least experienced residents had approximately eleven months of clinical training by the time they could respond. This timing was chosen to allow all respondents to have enough experience with the system to provide valuable information. Prior to the survey, we introduced the project at resident meetings and sent a link to the survey to all IM and EM residents via their institutional email addresses. Responses were collected over three weeks, with up to three reminder emails sent to those who had not yet responded.

In addition to characterizing current practices, the survey also provided potential explanations for why residents may not get patient outcome feedback and asked for their agreement on whether or not such factors were major barriers to learning patient outcomes. The survey questions (Table 1) were all with five-item Likert scales for responses. There were additional optional questions asking for comments. We also obtained information on the residents' specialty, year of training, and gender.

We generated descriptive statistics on survey respondents, and initial analyses of responses were simple proportions. We performed analysis of survey responses by dichotomizing answer choices for logistic regression (e.g. “strongly agree” and “agree” were grouped as “agree”; and “neutral,” “disagree,” and “strongly disagree” as “not agree”, as shown in Table 2). We adjusted for specialty, year of training and gender. To account for multiple comparisons, we used a correction outlined by Benjamini and Yekutieli.(26) Survey weights were not used. Survey analyses were done with the R statistical package.(27)

Respondents of the survey included 60 of 114 (53%) IM residents and 18 of 35 (51%) EM residents. The IM respondents also included nine in a medicine-pediatrics program, four preliminary interns, and three other residents in combined medicine programs; these were grouped with the IM residents for all further analyses. A summary of the respondents by specialty, year of training, and gender, is shown in Table 2.

Results

Chart Re-access

We obtained written consent from 71 of 114 (62%) IM residents and 26 of 35 (74%) EM residents after introducing the project at resident meetings. The gender and PGY breakdown is shown in Table 3. During the study period, the IM residents performed 4293 handoffs on 1496 unique patients and the EM residents performed 4397 handoffs on 2393 unique patients.

Overall, IM residents re-accessed patient charts within 14 days for 2289 of 4293 handoffs (53%) compared with 120 of 4397 (3%) for EM residents (depicted in Table 4 and Figure 1). There was substantial variation in the proportion of handoffs with subsequent re-access based on the type of clinical rotation ranging from 3% for ED and night admitting rotations to 67% and 69% for medical wards and cardiovascular medicine respectively (depicted in Table 5 and Figure 2). Examples of rotations listed as “other” include subspecialty consultant services and palliative care. There was less pronounced variation in chart re-access based on the level of care of the patient at the time of handoff.

The multivariable logistic regression analysis demonstrated several significant predictors of chart re-access. After adjusting for other variables, interns were less likely to re-access patient charts compared to other years of training, with an odds ratio (OR) of 0.85 ($p=0.04$). Residents handing patients off in the Emergency Department or on the night admitting rotations were much less likely to re-access patient charts compared to those in medical ward rotations, with ORs of chart re-access of 0.08 and 0.02 respectively. Handoffs at discharge were much more likely to have chart re-access, with OR of 2.4 compared to non-discharge handoffs. Additional regression results can be seen in Table 6. Overall, the model showed a good fit with a non-significant Hosmer-Lemeshow p -value. The area under the receiver operator curve (AUC) of the model was 0.90.

Survey Responses

The survey questions are presented in Table 1. The total numbers and proportions of responses for each question are shown with response options dichotomized; a full table of all respondents with each answer choice is available in the appendix.

Among the resident physicians who responded to the survey, most reported that receiving information about patients after handoffs was not a common phenomenon, although many said that they do actively search for such information. The vast majority said learning outcomes was important to both their education and job satisfaction, and that they were not satisfied with current systems of learning outcomes of patients after handoffs. Methods that were consistently used by a substantial proportion of our respondents included keeping a list of patients and looking them up (65.4%), and occasionally looking through all recent patients (45.3%). Other methods were much less consistently employed. The two main barriers cited were too little time (64.1%) and lack of a reliable system to track prior patients (71.8%). Most did not agree that expecting others to notify them of major events, a lack of system access, or little value placed on this information were significant barriers to finding out patient outcomes. On regression analysis, none of the tested variables were significant predictors of responses to individual survey items. The full survey regression results are available in the Appendix.

Seven of the participants provided comments on this survey, and all were regarding the difficulty of obtaining follow-up information despite how valuable it would be to receive it. Several expressed a desire for the electronic health record itself to have features enabling easy access to previous patients, such as a “follow-up” task box that could be easily populated, or automatically creating lists and records of recent patients with inpatient progress notes or outpatient follow-up notes. Some respondents mentioned the difficulty of understanding outcomes and eventual management decisions even if they do look up patients afterward, with poor quality of discharge summaries and other documentation. A few suggested that there should be improvements in education of residents, both in good documentation practices and the importance of finding out the outcomes of patients they have handed off. As an example, one comment read, “It would be great to build in some chart-review time to the resident schedule. No one ever discussed the value of this or helped us set up techniques for doing it on our own, though it is clearly useful and I wish I did more of it.”

Discussion

We performed a mixed-methods study involving analysis of IM and EM resident EHR access log data and a survey at an academic medical center to evaluate current practices, attitudes and perceived barriers related to obtaining feedback of patient outcomes after handoffs. The results of this study add to the literature by quantifying the disconnect between desired practices to follow-up on patient outcomes and the reality in our academic medical center. Overall, we found substantial room for improvement in providing consistent and reliable feedback of patient outcomes to residents. Most residents indicated that they were rarely able to get timely, accurate feedback on patients they had handed off, even

though they widely recognized that it was important to both their education and their job satisfaction.

Almost all agreed on the importance of learning outcomes, but there was a notable spread in the responses about current habits and opinions of residents. While the majority indicated that learning outcomes of previous patients was not a regular or common phenomenon, 25.6% said that they often or almost always do, which correlated with individual effort to track such outcomes. Therefore, despite nearly all valuing the importance of feedback, only a minority (perhaps with certain organizational skills or types of efficiency) is actually able to engage in this type of learning in current practice. This subset of residents may obtain the necessary feedback regardless of the type of documentation system or workflow. If programs could lower the barriers to obtain feedback, these important learning opportunities could become available to a large group of residents who may, in fact, need it more.

We found large variation in the proportion of handoffs after which the residents re-accessed the patient charts—particularly when comparing re-access rates across type of rotation and year of training. Since attitudes toward patient outcome feedback did not seem to vary based on year of training, it is likely that workflow plays a large role in the observed differences across rotations. For example, residents on medical ward rotations may re-access charts to complete discharge paperwork after discharge—something not required for patients admitted in the ED and handed off to other teams. Therefore, although the intent of the re-access may not be to follow up on the patient’s outcome, the workflow may provide a mechanism for residents to “close the loop” on some rotations and not others.

This difference in re-access rates has some important system and educational implications. The ED and overnight admitting rotations are scenarios with the most uncertainty and when many initial diagnostic and therapeutic plans are developed. Feedback of outcomes is important in all settings, but these scenarios are likely to represent especially fruitful learning opportunities. In addition, improved diagnostic calibration in these areas has the potential for significant impact on efficiency by altering who gets admitted to a hospital, to which clinical service and which diagnostic tests get initiated early in the hospitalization.

In the survey, almost all agreed on the importance of learning outcomes, but there was a notable spread in the responses about current habits and opinions of residents. While the majority indicated that learning outcomes of previous patients was not a regular or common phenomenon, 25.6% said that they often or almost always do, which correlated with individual effort to track such outcomes. Therefore, despite nearly all valuing the importance of feedback, only a minority (perhaps with certain organizational skills or types of efficiency) is actually able to engage in this type of learning in current practice. This subset of residents may obtain the necessary feedback regardless of the type of documentation system or workflow. If programs could lower the barriers to obtain feedback, these important learning opportunities could become available to a large group of residents who may, in fact, need it more.

These findings suggest that residents are not getting outcome feedback on their patients in many cases. The quantitative re-access rates support resident perceptions that feedback of

patient outcomes after handoffs is infrequent. The structure and schedule of training programs may also limit the time available to residents to objectively reassess their initial plans, making efficient feedback of patient outcomes crucial to developing and calibrating clinical assessments. Since diagnostic errors are not infrequent and account for 6 to 17 percent of hospital adverse events(28), this lack of feedback likely means that many errors are currently going unrecognized. As Croskerry emphasized, if physicians fail to identify an unanticipated outcome, they not only miss an opportunity to learn from their mistake, they are likely to further reinforce their potentially suboptimal decision-making.

The implications of this work are that our current system has many wasted learning opportunities to help calibrate clinical assessments and that training programs would benefit from enabling more systematic reflection of the accuracy of decision-making. The high number of handoffs has significantly restricted the ability to have a clinician personally see important clinical outcomes develop. As a result, lack of feedback can lead to missed opportunities to correct decision-making and therefore to future harm to patients, learners and practicing clinicians.

Potential Improvements

These results indicate that improvement in this area is needed, and would be welcomed by those who would benefit from increased outcome feedback. Some possible solutions fall into three general categories: 1) improving the education and training on mindful evaluation of residents' own practice, as has been discussed as being of significant value(2, 23, 29); 2) creating systems to make follow-up more efficient to obtain; and 3) dedicating time in the training program for this information and reflection. Since these areas describe learning that occurs after care has been handed off to other providers, the solutions need to be designed to balance educational opportunities with patient privacy considerations.

Improving education on self-evaluation may involve some conference time describing its value and discussing possible individual methods for residents to employ. This would be further helped by having such practices modeled by superiors and the topic revisited occasionally during the academic year. As it is often impossible to identify *a priori* which patients' outcomes would provide the best educational benefit, and unfeasible to follow up on all information of every patient seen, development of automated methods for identifying patients whose courses could provide substantial educational benefit (e.g., a course that deviated significantly from the expected trajectory) holds promise to meet this information need. Improving feedback efficiency and the education on its value may also require improved training in writing care summaries and progress notes, as the comments in our survey indicated that even those who do search for patient outcomes may have difficulty understanding the most salient aspects of a patient's course due to limitations in documentation. Improvements in record systems themselves may also be warranted, to make the task of capturing a true clinical course more efficient and accurate.

At the system level, both human and electronic interventions could help design in ongoing feedback of patient outcomes. As one example, our institution has arranged resident night team schedules to alternate admitting shifts with cross-covering ones—allowing interns to follow the trajectories of many of the patients they admitted. Another example is the

automated routing of discharge summaries back to the ED providers who admitted patients. These relatively simple changes can improve diagnostic learning and patient care, as well as reinforce a culture of open discussion of opportunities to improve care.

Dedicating time in a clinical training program for learning patient outcome feedback, along with the other possible areas for improvement, requires a system- or institution-wide recognition of this endeavor to be worth the time it would involve. A recent study with an intervention to facilitate feedback on post-discharge outcomes was highly valued by resident participants.⁽³⁰⁾ The perceptions elicited from our survey indicate that if outcome feedback were regularly incorporated into their learning, it may significantly improve the education and the job satisfaction of residents. Establishing this as a standard, common practice in residency could likely then carry this expectation of outcome feedback onward into independent practice, further refining clinical decision-making beyond training.

Limitations

This study had a few notable limitations. Our survey was limited to two specialties of one academic institution, and therefore may not be generalizable to physicians in training nationwide. In addition, our response rate was moderately low at 52.3%, likely explained in part by the fact that we did not offer any incentive for participating. Therefore, there may be some response bias in our results. Another limitation is that we did not use survey weights for the analysis of our survey responses. Our survey was also not formally tested prior to administration. Additionally, the data are now four years old, so some changes to the EHR have been made since the study. However, none of the new features directly affect the follow-up of patients after handoffs and therefore, the results are likely to remain similar today. Another limitation is that this study did not include interviews or focus groups to help explain the results. Finally, our assessment of “follow-up” relied on an electronic footprint of access. Non-electronic methods of feedback through conversation or access to paper records could lead to an underestimate of actual rates of follow-up.

Conclusion

Learning the outcomes of patients after handing them off to other care teams is an important aspect of education that is lacking in the current training of physicians. There was a general recognition of this as a problem among the residents we surveyed, and the main perceived barriers to obtaining such outcome feedback are time limitations and lack of current systems to incorporate feedback into regular practice. These barriers were generally consistent across emergency medicine and internal medicine, regardless of year of training or gender. Development of systems and educational structures to incorporate outcome feedback on clinical decision-making into regular training would be a welcome change to IM and EM residents, and is therefore deserving of attention for future efforts.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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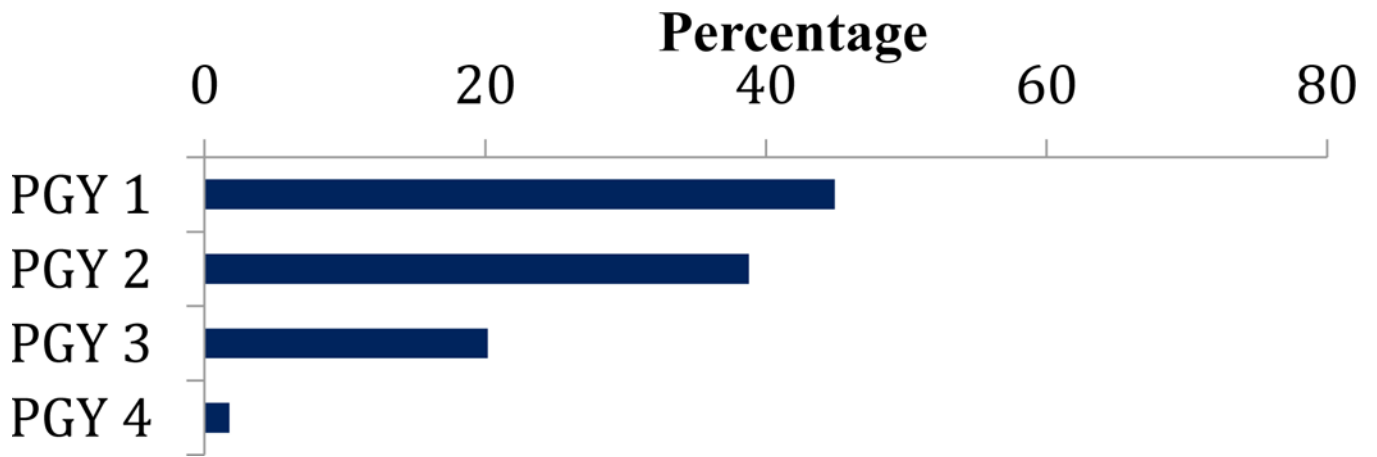


Figure 1:
Chart Re-access within 14 Days by Year of Training

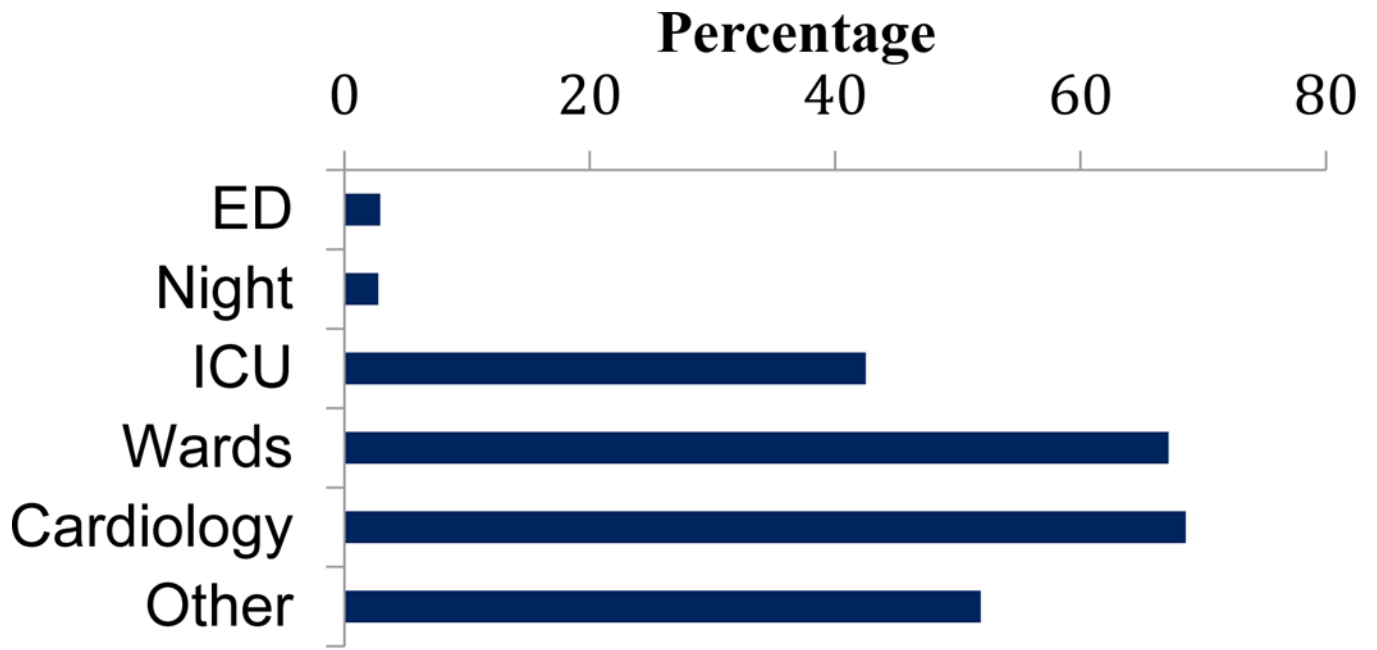


Figure 2:
Chart Re-access within 14 Days by Clinical Rotation

Table 1:

Survey Questions and Proportions by all Respondents

Survey Question	Responses N (%)	
	Almost Never to Sometimes	Often or Almost Always
1. How often does someone else send you information regarding the outcomes of hospitalized patients you handed off to other providers?	76 (97.4)	2 (2.6)
2. How often do you actively search for the outcomes of hospitalized patients you handed off to other providers?	38 (48.7)	40 (51.3)
3. Overall, how often do you find out the outcomes of hospitalized patients after you hand them off to other teams?	58 (74.4)	20 (25.6)
	Not at all Important to Neutral	Moderately or Very Important
4. How important to your <u>education</u> is learning the outcomes of patients you handed off?	4 (5.1)	74 (94.9)
5. How important to your <u>job satisfaction</u> is learning the outcomes of patients you handed off?	4 (5.1)	74 (94.9)
	Very Dissatisfied to Neutral	Satisfied or Very Satisfied
6. How satisfied are you with current systems available to learn about the outcomes of patients you handed off?	66 (84.6)	12 (15.4)
<i>Which method(s) do you use to learn about the outcomes of hospitalized patients you have handed off:</i>		
	Almost Never to Sometimes	Often or Almost Always
7. Keeping a list of patients of interest and looking up patients' medical records	27 (34.6)	51 (65.4)
8. Occasionally looking through all recent patients and looking up patients' medical records*	41 (54.7)	34 (45.3)
9. Directly contacting patients (e.g. phone calls)	72 (92.3)	6 (7.7)
10. Informal conversations with other providers (attendings, residents, PAs, NPs, RNs, etc.)	60 (76.9)	18 (23.1)
11. Attending a meeting or conference (e.g., M&M conference)	66 (84.6)	12 (15.4)
<i>Which of the following are the main barriers to learning the outcomes of patients you have handed off?</i>		
	Strongly Disagree to Neutral	Agree or Strongly Agree
12. Too little time given clinical responsibilities	28 (35.9)	50 (64.1)
13. No reliable system to keep track of post-handoff patient numbers	22 (28.2)	56 (71.8)
14. Expectation that if something major happens, someone will let me know	65 (83.3)	13 (16.7)
15. No access to record system (e.g., new rotation at a different hospital)	56 (71.8)	22 (28.2)
16. Little perceived value in doing so	76 (97.4)	2 (2.6)

* Three respondents skipped this question, so the totals do not sum to 78 as the others do.

M&M= morbidity and mortality conference, NP = nurse practitioner, PA = physician assistant, RN = registered nurse

Table 2:

Characteristics of Survey Respondents

<i>All respondents</i>	N (%)
Internal Medicine	60 (76.9)
Emergency Medicine	18 (23.1)
Interns (PGY-1)	25 (32.1)
2 nd year residents (PGY-2)	19 (24.4)
3 rd year residents (PGY-3)	26 (33.3)
4 th or 5 th year residents (PGY-4 or –5)	8 (10.3)
Male	40 (51.2)
Female	38 (48.7)
<i>Internal Medicine Residents</i>	N (%)
PGY-1	22 (36.7)
PGY-2	14 (23.3)
PGY-3	20 (33.3)
PGY-4 or –5 (combined programs)	4 (6.7)
Male	30 (50.0)
Female	30 (50.0)
<i>Emergency Medicine Residents</i>	N (%)
PGY-1	3 (16.7)
PGY-2	5 (27.8)
PGY-3	6 (33.3)
PGY-4	4 (22.2)
Male	10 (55.6)
Female	8 (44.4)

Table 3:

Providers analyzed for chart re-access

	Emergency Medicine (n=26)	Internal Medicine (n=71)	Total (n=97)
Male [n (%)]	16 (62)	39 (55)	55 (57)
PGY [n (%)]			
1	4 (15)	25 (35)	29 (30)
2	7 (27)	23 (32)	30 (31)
3	8 (31)	21 (30)	29 (30)
4	7 (27)	2 (3)	9 (9)

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Table 4:

Proportions of handoffs with chart re-access in 14 days, by resident PGY year

PGY	Emergency Medicine (%)	Internal Medicine (%)	Total
1	39/307 (13)	794/1537 (52)	833/1844 (45)
2	23/945 (2)	883/1331 (66)	906/2276 (40)
3	27/1689 (2)	609/1339 (45)	636/3028 (21)
4	20/1139 (2)	1/75 (1)	21/1214 (2)
Total	109/4080 (3)	2287/4282 (53)	2396/8362 (29)

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Table 5:

Proportions of handoffs with chart re-access in 14 days, by rotation and level of care

	Proportion of Handoffs with Reaccess within 14 days (n [%])
Rotation type	
Emergency department (n=3906)	88 (2)
Medical wards (n=2769)	1862 (67)
Night medical (n=544)	15 (3)
Intensive care unit (n=295)	129 (44)
Cardiovascular center (n=70)	48 (69)
Other (n=778)	254 (33)
Level of care at admission	
Medical-Surgical ward (n=4197)	1329 (32)
Telemetry (n=2055)	514 (25)
Intermediate medical unit (n=1440)	398 (28)
Intensive care unit (n=246)	60 (24)

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