Enhanced Communication for Interhospital Transfers Increases Preparedness in an Academic Tertiary Care Center

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Abstract

Objectives This quality improvement project sought to enhance clinical information sharing for interhospital transfers to an inpatient hepatology service comprised of internal medicine resident frontline providers (housestaff) with the specific aims of making housestaff aware of 100% of incoming transfers and providing timely access to clinical summaries.

Interventions In February 2020, an email notification system to senior medicine residents responsible for patient triage shared planned arrival time for patients pending transfer. In July 2020, a clinical data repository ("Transfer Log") updated daily by accepting providers (attending physicians and subspecialty fellows) became available to senior medicine residents responsible for triage.

Methods Likert scale surveys were administered to housestaff before email intervention (pre) and after transfer log intervention (post). The time from patient arrival to team assignment (TTA) in the electronic medical record was used as a proxy for time to patient assessment and was measured pre- and postinterventions; >2 hours to TTA was considered an extreme delay.

Results Housestaff reported frequency of access to clinical information as follows: preinterventions 4/31 (13%) sometimes/very often and 27/31 (87%) never/rarely; postinterventions 11/26 (42%) sometimes/very often and 15/26 (58%) never/rarely ($p = 0.02$). Preinterventions 12/39 (31%) felt "not at all prepared" versus 27/39 (69%) "somewhat" or "adequately"; postinterventions 2/24 (8%) felt "not at all prepared" versus 22/24 (92%) somewhat/adequately prepared ($p = 0.06$). There was a significant difference in mean TTA between pre- and posttransfer log groups (62 vs. 40 minutes, $p = 0.01$) and a significant reduction in patients with extreme delays in TTA post-email (18/180 pre-email vs. 7/174 post-email, $p = 0.04$).

Conclusion Early notification and increased access to clinical information were associated with better sense of preparedness for admitting housestaff, reduction in TTA, and reduced frequency of extreme delays in team assignment.

Keywords
- electronic health records and systems
- communication barriers
- provider–provider
- inpatient care
- hospital information systems

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Background and Significance

Interhospital transfer (IHT) occurs frequently in the United States, most often to facilitate patient access to treatments or specialists not available in their local hospitals.[1] While access to specialty care may facilitate appropriate care delivery, patients undergoing IHT are at risk for adverse events near the time of transfer and worse outcomes after transfer (including increased length of stay, greater risk of transfer to an intensive care unit [ICU], and higher 30-day mortality).[2–4] Some adverse events and worse outcomes may be related to inadequate communication between hospitals and also among providers at the receiving hospital, given that the accepting physician (typically an attending) is different from the frontline provider receiving the patient at the time of their arrival (typically residents).[4,5] Delays in care may be related to bed availability preventing prompt transfer to the center where optimal specialty care can begin, or redundant diagnostic testing at the receiving facility in the absence of access to complete and timely records from the sending hospital.[4,6]

Organizational Context

Our hospital is a large, academic, tertiary care center receiving many patients via IHT for subspecialty care. Our center has developed a robust, structured, IHT process involving a dedicated, offsite transfer center with staff trained to facilitate medical communication between outside hospitals (OSHs) and our clinical teams, and coordinate care for over 100 patients per day. A detailed schematic is depicted in ►Fig. 1.

There are several clinical roles relevant in the care of transferred patients:

- Triage resident: postgraduate year 3 (PGY-3) internal medicine resident. Individuals serve in this role for 12-hour shifts during 2-week periods throughout the year. This role is covered 24/7 by a PGY-3 (also known as senior) resident. They are responsible for evaluating and triaging all intrahospital transfers and IHTs to an appropriate primary team on medicine service lines.
- Accepting physicians: attendings/fellows. For patients transferred to the hepatology service, an attending and/or fellow from the transplant hepatology service communicates with providers at OSHs via the transfer center daily and decides to accept or decline patients for IHT.
- Admitting physicians: internal medicine residents.PGY-1 residents supervised by PGY-2/PGY-3 residents are responsible for admitting and initiating care for IHTs upon triage by the Triage Resident to a primary team staffed by internal medicine residents. Residents on the hepatology service are supervised by a gastroenterology or transplant hepatology fellow and transplant hepatology attending.

The term "housestaff" will be used to discuss all residents, as residents in this program rotate through both primary team and Triage Resident roles, and PGY-3 survey respondents had frequently served in both capacities. Fellows and attendings are considered together, separate from the housestaff (residents), as they have direct communication with OSH providers.

Several structural challenges to information sharing between hospitals exist in this system:

- The accepting and admitting physicians for transferred patients are different.
- Patients are transferred from numerous hospitals in various states, many of which do not share electronic medical record (EMR) access with our system; clinical data are therefore limited to what is available in hard copy form at the time of the patient's transfer. Receiving providers must make additional calls to supplement information.
- A large majority of patients arrive overnight due to bed availability; therefore, both nursing and primary team handoffs/discharge documentation may be limited by lack of familiarity with the patient's hospital course.

The intervention focused on the inpatient hepatology service, as this is a service receiving a very high volume of IHTs and on which patients tend to be acutely ill (in the 6 months prior to this project's first intervention, an average of 26 IHT patients arrived per month to this service). Therefore, timely access to clinical information is critically important for safe initiation of care. A separate nurse-to-nurse clinical handoff process is also facilitated by the transfer center; the scope of this handoff differed from the information housestaff identified as their biggest barriers to timely triage and initiation of care. As such, only the processes affecting flow of information to housestaff are discussed here.

Prior to our quality improvement (QI) project, no standardized process existed for the Triage Resident to be notified of a patient's planned transfer, nor of their arrival to the floor for assessment and triage. When a patient arrived on their destination hospital unit, the floor staff (business associate, nurse, or patient care associate) notified the Triage Resident that the patient had arrived and required assessment. However, the specific party responsible for notifying the Triage Resident varied by unit and often by time of day and staffing availability. Patients would occasionally wait several hours prior to Triage Resident assessment due to breakdowns in notification chains. Additionally, no automated system existed for the Triage Resident or admitting provider to access the clinical information collected daily by the accepting provider from OSH providers. Overnight triage and treatment were therefore based only on the clinical information that arrived with the patient and the patient's report. Access to adequate clinical information from sending hospitals was variable, as was the ability to interview patients with hepatic encephalopathy (frequently encountered in patients awaiting liver transplantation). Needs assessment surveys of admitting physicians noted that inconsistent notification of patients' arrival to floor and inadequate access to clinical information from sending hospitals and accepting providers were barriers to timely initiation of care.

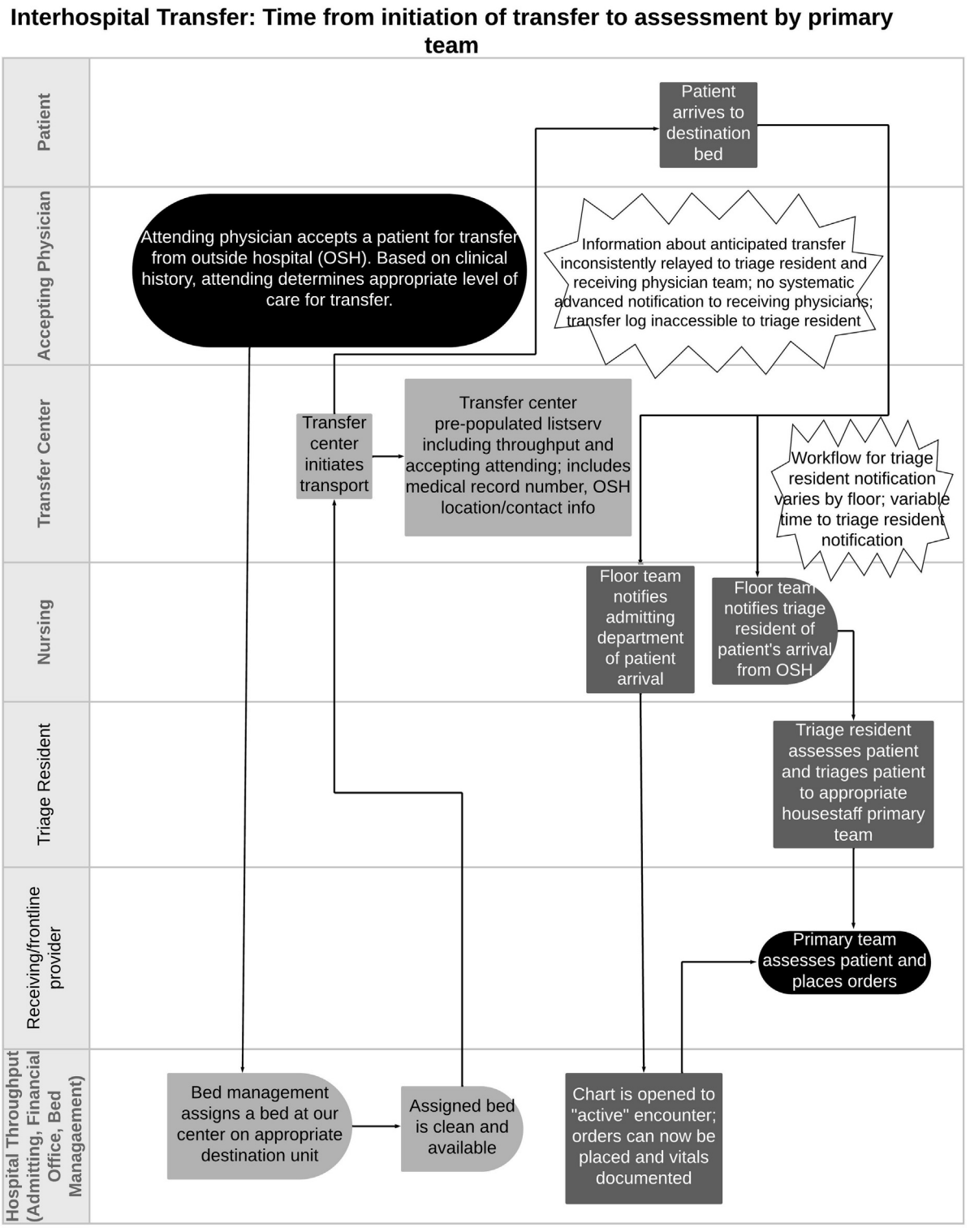

Fig. 1 Process map of transfer process from outside hospital to patient triage to receiving physician team.

Objectives

This QI project sought to enhance clinical information sharing for IHTs to the inpatient hepatology service with the specific aims of making frontline admitting providers aware of 100% of incoming transfers to this service and providing access to patients' clinical summaries at the time of patient arrival.

Methods

Interventions

Two Health Insurance Portability and Accountability Act (HIPAA)–compliant communication initiatives were launched after approval by the Department of Medicine Quality Improvement Committee.

Patient Name:	XXX
Medical Record # / Visit #:	XXX / XXX
Diagnosis:	XXX
Bed Assignment:	XXX
Ambulance Co. / Pick Up Time:	Safe Transfer Ambulance/ 08/16/2020 23:00
Accepting MD:	Accepting Attending Name
Accepting Hospital:	MSH - Mount Sinai Hospital
Referring MD / Phone:	Sending Attending Name/Phone
Referring Hospital:	Referring Hospital Name
Unit Name / Phone:	Unit Name/Unit Phone

- *Triage email*: In February 2020, an email notification system was enacted in which planned arrival time for patients pending transfer was sent from the transfer center to a shared email account to which access was given to all residents rotating through the Triage Resident role. Prior to the project, the transfer center notified the accepting physicians and hospital bed management leadership of transportation times for accepted patients by email (►**Supplementary Appendix**, available in the online version). However, these email notifications did not include the Triage Resident. The recipients of these emails were manually populated depending on the patient's care team. For this intervention, the transfer center was asked to add the shared Triage Resident email account to this email such that anyone in the Triage Resident role would be able to see the notification. The Triage Resident, tasked with initial evaluation and triage of transferred patients, monitored the shared email inbox for patients who were accepted to medicine services and added these patients to their active patient list in the EMR. When patients arrived at our center, the business associate on the destination unit both notified the Triage Resident by phone and "activated" the patient's hospital encounter, which was indicated in the EMR and could be seen in real time.
- *Transfer log*: In July 2020, a clinical data repository ("Transfer Log") where accepting physicians–documented updated clinical notes from daily conversations with OSH providers were made available to admitting physicians for reference overnight. The contents of the transfer log were semi-standardized and contained general medical history, presenting chief complaint, and significant details of hospital course with most relevant labs (►**Supplementary Appendix**, available in the online version).

Measures

Data from patients transferred between August 2019 and November 2020 were collected. Likert scale surveys assessing resident comfort with the transfer process were administered before the February 2020 email intervention (pre) and after the July 2020 transfer log intervention (post). Surveys were administered using REDCap electronic data tools hosted by Mount Sinai Hospital.[7,8] Time from patient arrival to team assignment (TTA) in the EMR was used as a proxy for time to patient assessment by a provider. TTA was measured before and after each intervention separately—6 months pretriage email versus posttriage email (but before transfer log); and pretransfer log (but after triage email) versus posttransfer log. Extreme delay in TTA was defined as >2 hours from patient arrival to team assignment. Extreme delays in TTA were evaluated by comparing all patients transferred before implementation of the triage email versus after the triage email. Patients arriving during the first COVID-19 surge (from April 2 to May 18, 2020) were excluded because of changes in staffing models on the clinical care teams and changes to usual triage structures. Survey administration was also interrupted during this time, resulting in administration of the postintervention surveys after the implementation of both the triage email and transfer log interventions. Surveys were administered to all residents in all years of training who had rotated on the hepatology service or in the role of Triage Resident at the end of each 2-week rotation. Presurveys were sent out from September 2019 to February 2020, and postsurveys were sent from June to December 2020. Residents who had already received the postsurvey were not asked to complete it a second time (i.e., they had completed two rotations on the hepatology service in the "post" period, or they had completed one rotation as Triage Resident and one rotation on the hepatology service). Statistical analysis was performed using SAS Studio Software (Copyright 2012–2020, SAS Institute Inc., Cary, NC, United States).

Results

A total of 354 patients were transferred to the hepatology service during the study period in the following time intervals: 180 arriving in the 6 months prior to the use of the triage email (but before transfer log); 83 arriving pretransfer log (but after triage email); and 91 arriving posttransfer log. Of note, patients arriving between April 2 and May 18, 2020, were excluded because of COVID-19 staffing redeployment. On average, 22 patients were transferred per month (range: 11–30 patients). Also, 269 (76%) patients arrived overnight (7 pm to 7 am). Within 24 hours of arrival to our center, 24 patients (7%) were upgraded to a more acute level of care (2 to a stepdown unit, 22 to an ICU).

After implementation of a common triage email account, advanced notification emails from the transfer center were delivered to the triage email account for 159/176 patients. Response rates for survey administration were 29% (42/144) and 22% (31/144) for pre- and postintervention surveys, respectively. Admitting physician respondents reported frequency of access to clinical information as follows (►**Fig. 2**): preinterventions, 13% (4/31) sometimes/very often and 87% (27/31) never/rarely; postinterventions, 42% (11/26) sometimes/very often and 58% (15/26) never/rarely (Fisher's exact $p = 0.02$). Preinterventions 31% (12/39) felt "not at all prepared" versus 68% (27/39) felt somewhat/adequately prepared. Postinterventions 2/24 (8%) felt "not at all

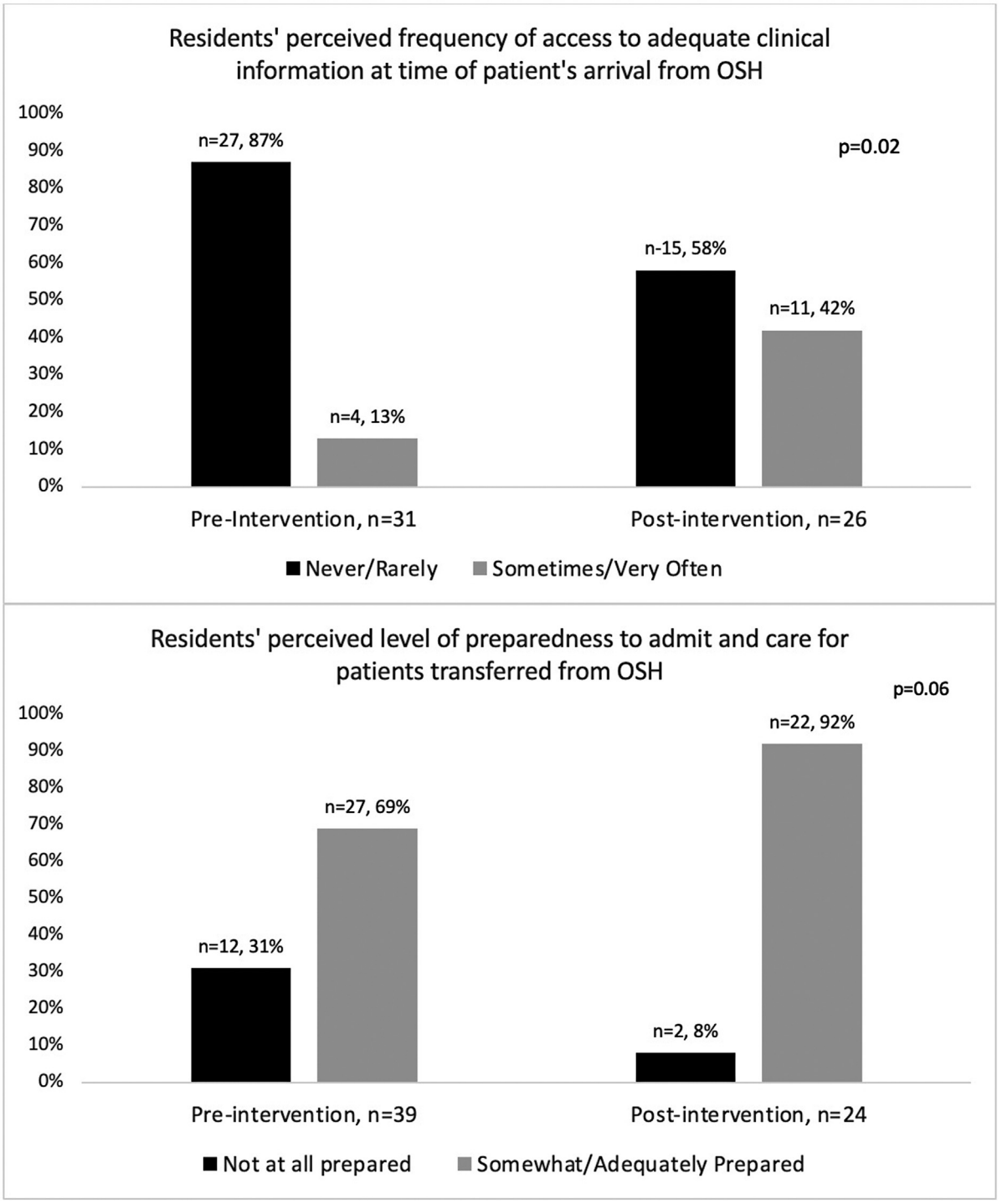

Fig. 2 Resident survey responses pre-email vs. post-transfer log.

prepared" versus 92% (22/24) felt somewhat/adequately (Fisher's exact $p = 0.06$). Those who responded neutrally are not depicted in the figure.

For TTA, there were 180 "pre-email" and 79 "post-email" patients transferred to our center. There was no significant difference in mean TTA pre-email versus post-email (52 minutes for pre-email versus 62 minutes for post-email; $p = 0.24$) (►Fig 2). There were 79 "pretransfer log" (excluding 180 "pre-email") and 95 "posttransfer log" patients. There was a significant difference in mean TTA pre- versus post-transfer log (62 minutes for pretransfer versus 40 minutes for posttransfer, $p = 0.01$) (►Fig. 3).

A total of 180 transferred patients arrived at our center before the implementation of the triage email and 174 patients arrived after its implementation (including those who arrived after the use of the transfer log). A significant reduction in proportion of patients with extreme delay in TTA was observed after the implementation of the triage email (7/174 postimplementation compared with 18/180 preimplementation; Fisher's exact $p = 0.04$).

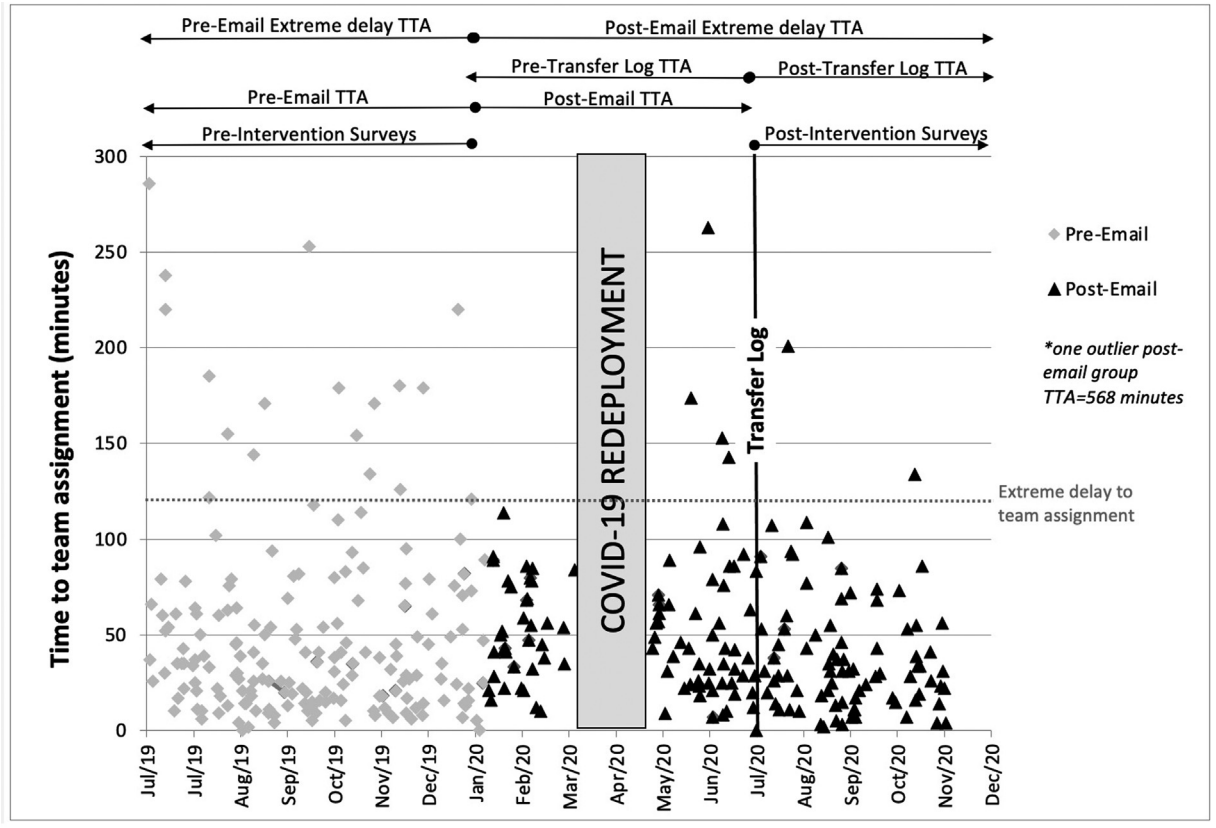

Fig. 3 Time to team assignment and timing of interventions.

There was no significant difference in rate of upgrade to a higher level of clinical care pre- versus post-email (9 upgrades pre-email, 15 upgrades post-email; $p = 0.21$), nor in TTA for patients who required higher level of care (mean: 47 minutes for patients upgraded in 24 hours vs. 51 minutes; $p = 0.55$).

Discussion

Transitions of care happen frequently—at change of shift, before and after procedures, every time a patient is moved to a different floor within a hospital, most weekends. To varying degrees, transitions of care are relatively high-risk periods for patients. Prior literature demonstrates the increased risk of adverse events and worse clinical outcomes in patients undergoing IHT, especially those who are critically ill.[2,3] Our center receives a large volume of patients transferred to a subspecialty hepatology service where most patients are either undergoing evaluation for or actively awaiting liver transplantation. Although we were able to accommodate fewer IHTs during the postintervention period than in prior months due to high patient censuses and limited resources in the setting of COVID-19, the volume of transferred patients remained close to 1 per day, making this a clinically relevant issue for our patients and providers. The clinical acuity of these patients is evidenced by the high rate of transfer to higher level of care within 24 hours of arrival and is expectedly higher than rates described in other IHT literature describing all-comers to general medicine floors.[9] Similar to prior studies,[4] our survey respondents noted delayed notification of patient arrival and inadequate access to relevant clinical information as risk factors for adverse events and barriers to clinical care.

The implementation of the triage email was a targeted intervention aimed at providing advanced notification of incoming transfers such that admitting physicians could actively monitor for patient arrival. We consider the uptake of this intervention to be a success, as defined by the high percentage of emails delivered by the transfer center to our triage email account. "Missed" emails were identified in real time by residents who brought this to our team's attention, or retrospectively in batches during spaced interval audits by our team, and this information was relayed back to the transfer center, who conducted their own internal process adjustments to ensure consistent delivery. This intervention was designed with the goal of reducing the frequency of extreme delays and overall time to team assignment and initiation of care by a primary team. It was thought that these delays were most often due to delayed notification of a transferred patient's arrival to the Triaging Resident. Barriers to timely evaluation of transferred patients at our institution include reliance on floor staff for Triage Resident notification of patient arrival, competing clinical responsibilities on the Triage Resident shift, and inconsistent access to hospital course data needed to triage a patient to the appropriate level of care based on current clinical acuity. Advanced notification of expected patient arrival allowed Triage Residents to plan their remaining clinical responsibilities such

that they would be more likely available to assess transferred patients close to their time of arrival and also allowed Triage Residents to proactively monitor patients' arrival status in the EMR in real time. Mean TTA did not significantly decrease with our interventions; however, frequency of extreme delays in team assignment decreased significantly after the implementation of the triage email and early transfer notification from the transfer center.

The implementation of the transfer log was a targeted intervention developed with the aim of increasing admitting physician access to clinical information, given the variable quality and quantity of clinical information arriving in paper form with the patient and available through EMR integration. There is frequently a significant delay from time of transfer initiation to time of patient arrival to our center; during the study period, median time from the sending hospital's first call to the transfer center to the patient's arrival at our hospital was 17 hours (ranging from minimum 3 hours to maximum 10 days). Owing to throughput patterns and bed availability, a significant majority of our transferred patients arrive overnight, after beds are vacated by discharged patients. Overnight, the accepting physicians (in this case, the transplant hepatology attending and fellow) are offsite; this is also typically the case for the primary providers caring for the patient at the sending hospital. This left the admitting physicians responsible for admitting and caring for these patients with inconsistent access to both documentation and providers knowledgeable about the patient's overall medical history and hospital course prior to transfer. Although the transfer log was updated after daily conversations with OSH providers, and was based on a semi-standardized template, patients sometimes arrived $>$12 hours after last update, especially in cases where the sending hospital was far away. This meant that admitting physicians still relied upon integrated EMR access or hard copies of medical records sent with patients for granular data (e.g., culture data with sensitivities, most recent laboratory/vitals results, printed notes from consultants, detailed imaging/pathology reports, etc.).

There was a significant decrease in TTA after admitting physicians were able to view the transfer log. Documentation in the EMR did not note root causes for delays in evaluation and team assignment. However, it is possible that easy access to clinical information may have reduced the amount of time Triage Residents spent gathering additional data needed for informed patient triage, thereby contributing the observed reduction in time to team assignment after its implementation. Prior to gaining access to the transfer log, most admitting physician survey respondents felt they lacked access to necessary clinical information for safe clinical care and were inadequately prepared to admit transferred patients.

Survey responses collected after the initiation of the transfer log demonstrated a significantly increased frequency of perceived access to relevant clinical information by admitting physicians. Although not statistically significant, the proportion of residents who felt adequately prepared to admit transferred patients increased, which was considered a signal of enhanced communication in this QI intervention. Although admitting physicians reported significantly increased frequency of access to clinical information after the introduction of the triage email and transfer log, it is notable that only 42% of respondents felt they had access to all available clinical information sometimes or very often even after what were considered successful interventions. In spite of this, 92% reported that they felt somewhat or adequately prepared to admit and care for transferred patients. This discrepancy may allude to the fact that there was a wide range of access to granular clinical data from sending hospitals (rather than that which was requested by accepting fellows/attendings and summarized in the transfer log). Some patients arrived at our center with paper copies of laboratory results, discharge summaries, recent vitals, records of medication administration, and imaging reports/discs, while others arrived with minimal collateral information from centers that did not support remote access to their EMRs. Thus, despite improved relative access to clinical information postinterventions, there is still room for improvement in communication of clinical events and data between our hospital and sending hospitals. Additionally, the transfer log frequently included anticipatory guidance written by fellows for admitting physician use when patients arrived overnight, which may have further improved housestaff level of comfort with providing care. It is also noteworthy that there was a relatively low response rate for both pre- and postsurveys, with a lower response rate in the postintervention group. One possible explanation is that people are more likely to complete surveys when their experience approaches an extreme positive or negative; another is that many residents offered feedback to the quality team in real time via email or in-person in the postintervention period and thus were less motivated to provide formal feedback in survey form.

This project was unable to account for the effects of interruptions in transfer volume, staffing, and serial survey administration caused by the first wave of the COVID-19 pandemic, which struck New York City almost immediately after the implementation of the triage email. Additionally, the timing of the two interventions spanned academic years (which begin on July 1 with a new group of residents); thus, the Triage Residents responsible for triage were a different group of residents before and after July 1, 2020, although there is no reason to believe that one class would have been inherently different from the other in their triage speed or skill level. Furthermore, our measurement period spanned nearly half the academic year, such that any transitional growing pains for the new class of Triage Residents, which might have affected our interpretation of the results in the short term, are likely to have settled back to a steady state of operation. However, many survey respondents were the same in the pre and post survey groups administered in 9/2019-2/2020 and 6/2020-12/2020 (as the surveys were administered to all residents who had rotated on the hepatology service and had participated in admitting transferred patients during any period of their training). Additionally, the high volume of transfers allowed for quantitative detection of changes in practice pattern with respect to time to team assessment.

Medical information silos are numerous and not only between institutions but also within them. A survey of nearly 300 internal medicine residents reported finding frequent inaccuracies in documentation for patients being transferred from ICUs to the general floors with resultant near-misses or adverse events, and not all had a standard practice of verbal handoff at the time of patient transfer.[10] Interestingly, the types of information most likely to be included and missing in documentation varied by site,[10] suggesting some degree of cultural practice involved, and, when extrapolated to IHT, it is easy to imagine why the transition of care process may be even more prone to communication failures. Our results suggest that more so than advanced notification via the shared triage email, access to relevant clinical information reduced delays in patient care. In general, as patient care becomes increasingly complex and interdisciplinary, there is a significant need for more automated systems to fill these gaps in information exchange between providers and care sites, not only to reduce miscommunication or information losses affecting patient safety around transitions of care (whether IHT or change of shift), but also to reduce an already significant clerical burden on providers. The development of any future tools should consider a balance of standardized and relevant information to mitigate site-specific differences in documentation practices with allowance for some degree of flexibility and customization for individual patients and providers to maximize their likelihood of adoption and longevity.[11,12]

Conclusion

Early notification and increased access to clinical information for admitting physicians were associated with improved admitting physician access to relevant clinical information at the time of transfer, decreased frequency of extreme delay and time to assessment, triage, and initiation of care for patients transferred to our center for subspecialty care. The triage email notification system has been adopted for patients accepted to the general medicine and oncology services for IHT and direct admission. The transfer log remains in use on the hepatology service, more than one academic year after its initiation. Adoption of similar systems for enhanced information sharing for IHTs may be a useful intervention in other hospital systems where the accepting and frontline physicians are different. In particular, for teaching hospitals, such interventions may enhance trainees' experience by improving patient safety with consistent, timely triage, reducing administrative workload with streamlined access to clinical data to inform clinical learning and decision-making, and making admitting physicians feel valued as integral members of the team with the same real-time access to information as accepting fellows and attendings.

Clinical Relevance Statement

IHTs represent a critically important transition of care for patients. One reason for increased patient morbidity and mortality is lack of access to clinical information for frontline providers, who are often different from those who accept patients for transfer. The current study examines two informatics-based interventions for resident frontline providers: advanced notification of patient arrival, and access to relevant clinical information shared with the accepting provider. Enhanced communication among provider teams can improve patient safety, outcomes, and clinician satisfaction.

Multiple Choice Questions

1. Which of the following is true about clinical information sharing in interhospital patient transfers?
   a. The accepting physician and the admitting physician are always the same
   b. A complete record of clinical data is always available to the admitting physician at the time of patient arrival through paper or shared electronic medical records
   c. Inadequate communication may result in adverse outcomes for patients undergoing interhospital transfer
   d. The admitting physician always receives advanced notification of patient's planned transfer

   Correct Answer: The correct answer is option c. Many health systems use electronic medical record systems that are not integrated, requiring providers to send hard copies of clinical data with the patient at the time of transfer, or through a third party such as a central transfer center or directly to the accepting physician (often an attending, while the frontline provider admitting the patient may be a resident or midlevel provider). Patients frequently arrive to receiving hospitals without the admitting provider's advanced knowledge, leaving no time to review clinical data and acquire missing information prior to assessment. One reason for the increased morbidity and mortality seen in patients undergoing interhospital transfer may be inadequate communication between providers at different hospitals, as well as inadequate communication between providers at the receiving hospital (those accepting the patient and those admitting the patient).

2. When implementing a new clinical information communication system, which of the following measures can be considered?
   a. Uptake/usage
   b. Clinician satisfaction
   c. Effects on patient outcomes
   d. All of the above

   Correct Answer: The correct answer is option d. The quality improvement project described measured the frequency with which the admitting physicians received the advanced notification email for patients pending interhospital transfer, conducted descriptive surveys regarding their level of comfort and satisfaction before and after the communication interventions were implemented, and compared objective measurements of time to assessment pre- and postinterventions.

Protection of Human and Animal Subjects

This project was reviewed and approved by the Mount Sinai Department of Medicine Quality Improvement Committee as a quality improvement, nonresearch project. It was therefore exempt from review by the Institutional Review Board.

Conflict of Interest

None declared.

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