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Implementation of a standardised accept note to improve communication during inter-hospital transfer: a prospective cohort study

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ABSTRACT

Importance The transfer of patients between hospitals (interhospital transfer, IHT), exposes patients to communication errors and gaps in information exchange.

Objective To design and implement a standardised accept note to improve communication during medical service transfers, and evaluate its impact on patient outcomes.

Design Prospective interventional cohort study.

Setting A 792-bed tertiary care hospital.

Participants All patient transfers from any acute care hospital to the general medicine, cardiology, oncology and intensive care unit (ICU) services between August 2020 and June 2022.

Interventions A standardised accept note template was developed over a 9-month period with key stakeholder input and embedded in the electronic health record, completed by nurses within the hospital's Access Centre.

Main outcomes and measures Primary outcome was clinician-reported medical errors collected via surveys of admitting clinicians within 72 hours after IHT patient admission. Secondary outcomes included clinician-reported failures in communication; presence and 'timeliness' of accept note documentation; patient length of stay (LOS) after transfer; rapid response or ICU transfer within 24 hours and in-hospital mortality. All outcomes were analysed postintervention versus preintervention, adjusting for patient demographics, diagnosis, comorbidity, illness severity, admitting service, time of year, hospital COVID census and census of admitting service and admitting team on date of admission.

Results Of the 1004 and 654 IHT patients during preintervention and postintervention periods, surveys were collected on 735 (73.2%) and 462 (70.6%), respectively. Baseline characteristics were similar among patients in each time period and between survey responders and non-responders. Adjusted analyses demonstrated a 27% reduction in clinician-reported medical error rates postimplementation versus preimplementation (11.5 vs 15.8, adjusted OR (aOR) 0.73, 95% CI 0.53 to 0.99). Secondary outcomes demonstrated lower adjusted odds of clinician-reported failures in communication (aOR 0.88; 0.78 to 0.98) and rapid response/ICU transfer (aOR 0.57; 0.34 to 0.97), and improved presence (aOR 2.30; 1.75 to 3.02) and timeliness (−21.4 hours vs −8.7 hours, p<0.001) of accept note documentation. There were no significant differences in LOS or mortality.

Conclusions and relevance Among 1658 medical patient transfers, implementing a standardised accept note was associated with improved presence and timeliness of accept note documentation, clinician-reported medical errors, failures in communication and clinical decline following transfer, suggesting that improving communication during IHT can improve patient outcomes.

WHAT IS ALREADY KNOWN ON THIS TOPIC

Existing literature suggests that poor communication during interhospital transfer (IHT, the transfer of patients between acute care hospitals) is common and is a significant contributor to adverse outcomes among this patient population. Structured communication tools have been successful at improving patient outcomes among patients undergoing other high-risk care transitions (eg, intrahospital patient handoffs).

WHAT THIS STUDY ADDS

This study specifically addresses existing gaps in knowledge by evaluating the patient safety impact of implementation of a structured communication tool for use among patients undergoing IHT, a vulnerable population of hospitalised patients.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

This study demonstrates that implementation of a structured communication tool during IHT is associated with improved quality and patient safety outcomes. This suggests that hospitals should consider policies to direct utilisation of a standardised communication tool to improve the care we provide during interhospital transfer.

INTRODUCTION

The transfer of patients between acute care hospitals, or interhospital transfer (IHT), is a regular occurrence, with over 100 000 Medicare patients (1.5%) undergoing IHT annually[1] and greater frequency among select patients with common diagnoses.[1–5] Though often necessary to provide specialised care,[2 6 7] IHT practices are highly variable[8] and expose

patients to risks of discontinuity of care, such as errors in communication and gaps in information transfer seen commonly among other hospital-based care transitions (ie, patient discharge, intrahospital patient handoffs).[9–12] Moreover, the risks are even more significant in the IHT patient population given their severity of illness[1 13] and the absence of mitigating factors to fill in gaps in communication, such as common electronic health records (EHR).

Existing literature has suggested that poor communication during IHT is common and is a significant contributor to adverse outcomes among this patient population,[14] including missing clinical information leading to diagnostic errors or redundant testing[13 15]; absent or misleading test results or clinical condition leading to mistriage[16–18] and absent or misleading reason for transfer,[19] leading to confusion regarding expected care, therapeutic errors and patient/family dissatisfaction. Clinicians caring for IHT patients commonly describe feeling unprepared to safely care for these patients due to incomplete patient information that accompanies the patient at the time of arrival.[7 20] Suboptimal communication during IHT has been associated with poor downstream outcomes such as prolonged length of stay (LOS) and increased mortality.[16–18]

Although there is an association between inadequate communication and patient safety outcomes during IHT, few solutions have been trialled.[17] Though there has been suggestion of improved patient outcomes in IHT with use of a structured handover tool[21] and when enhancing information exchange via existent EHR platforms,[22] implementation and evaluation of standard communication practices have yet to be rigorously studied among the IHT population. In this study, we used key stakeholder input and an evidence-based approach[23 24] to design and implement a standardised 'accept note' to improve communication during IHT and rigorously evaluate its impact on patient outcomes.

METHODS

We conducted a prospective cohort study including all adult patients (age ≥18) transferred from any acute care hospital to the general medicine (GMS), cardiology, oncology or intensive care unit (ICU) services at an 792-bed tertiary care hospital in Boston, Massachusetts. This study was approved by the hospital's Institutional Review Board.

Due to lack of direct interaction with patients as part of this study, patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

Study population

Patients were included if they were transferred to any of the included services during our baseline data collection period between August 2020 and June 2021 and during our intervention data collection period between August 2021 and June 2022. We excluded patients transferred from somewhere other than an acute care hospital (eg, emergency room transfers, direct hospital admissions). We also intentionally excluded patients who were transferred during July 2021 to allow for a sufficient wash-in period for our intervention. Notably, we were unable to include ICU service patient transfers between August 2020 and November 2020 (4 months of baseline time period) due to a delay in the decision to incorporate ICU service transfers in our cohort, or any patient transfers during September 2021 (1 month of the intervention time period) due to change in research support personnel.

Baseline practices

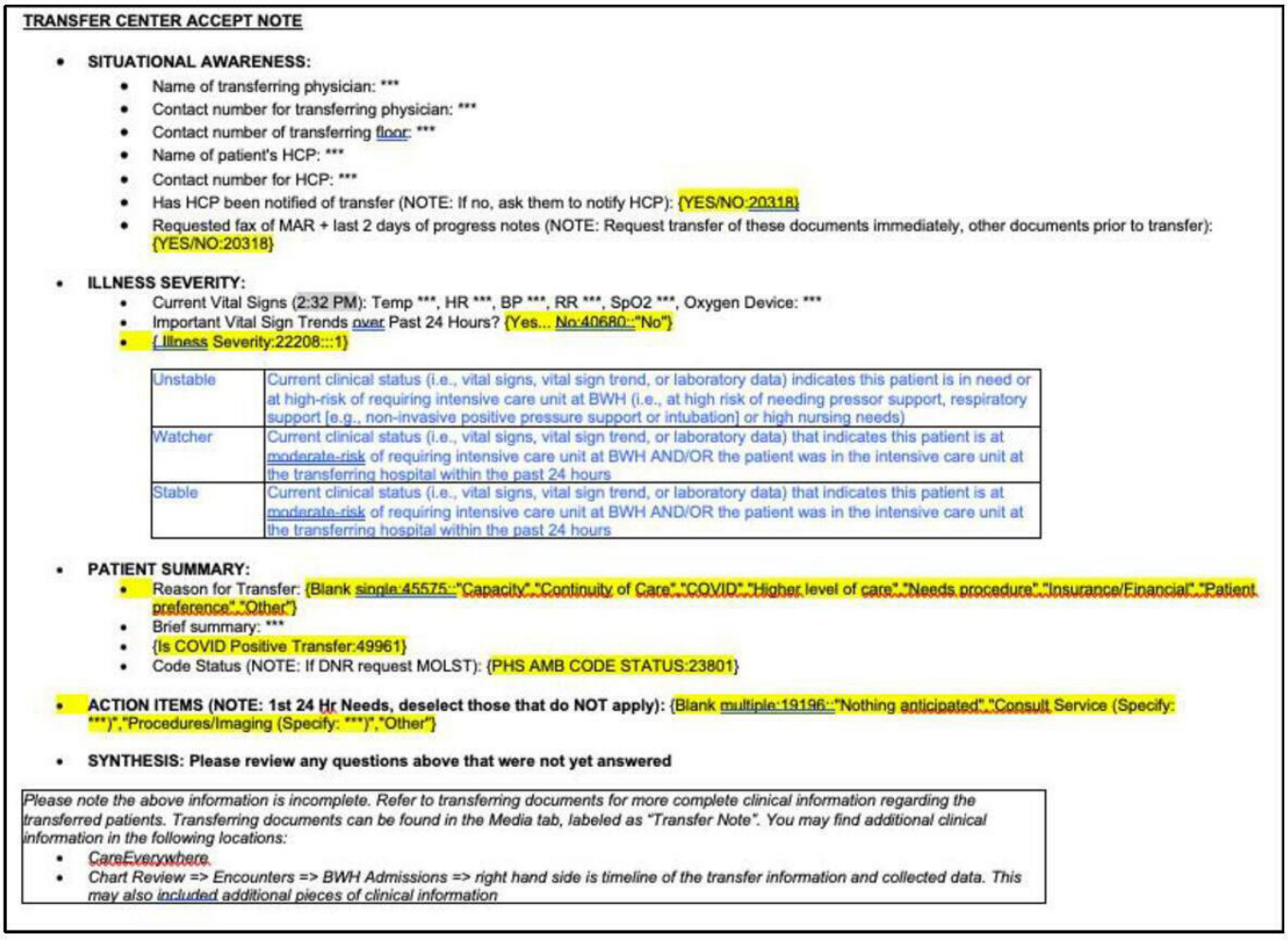
At baseline (ie, prior to this intervention), documentation of clinical information regarding patient transfers was variable. Nurses that staff the hospital's 'Access Centre', responsible for coordinating all patient transfers to our hospital and documentation of clinical information at the time of IHT patient acceptance, would document some clinical information within the 'Transfer Module' in the EHR. Documentation of a more formal Accept Note at time of patient acceptance was variable and expectations for documentation depended on the service of admission. There was no expectation for documentation among patient transfers to the ICU or oncology services, though some accepting clinicians chose to document via a note within the EHR. Among patient transfers to GMS or cardiology, there was an expectation to document a note within the EHR, though this responsibility was diffused across all attending physicians responsible for accepting patients for transfer, and there were not standard guidelines for documentation, leading to unreliable and varied documentation practices.

Design of the standardised accept note

Over the course of 9 months (September 2020 through June 2021), we engaged a group of key stakeholders within the hospital involved in IHT, including: (1) medicine residents and physician assistants responsible for admitting IHT patients at the time of arrival; (2) attending medicine physicians responsible for accepting IHT patients for transfer and (3) frontline nurses and leadership within our hospital's 'Access Centre responsible for coordinating all patient transfers to our hospital and documentation of clinical information at the time of IHT patient acceptance.

The working group met bi-weekly and used foundational quality improvement tools to develop a standardised accept note for use among all IHT patients to included services, including:

- Generation of a process map of collection and documentation of clinical information at time of patient acceptance for transfer, used to identify key barriers to access and documentation.
- Identification of most essential clinical information to include within a standardised accept note (eg, from the perspective of admitting and accepting clinicians).



TRANSFER CENTER ACCEPT NOTE

- **SITUATIONAL AWARENESS:**
  - Name of transferring physician: ***
  - Contact number for transferring physician: ***
  - Contact number of transferring floor: ***
  - Name of patient's HCP: ***
  - Contact number for HCP: ***
  - Has HCP been notified of transfer (NOTE: If no, ask them to notify HCP): {YES/NO:20318}
  - Requested fax of MAR + last 2 days of progress notes (NOTE: Request transfer of these documents immediately, other documents prior to transfer): {YES/NO:20318}
- **ILLNESS SEVERITY:**
  - Current Vital Signs (2:32 PM): Temp ***, HR ***, BP ***, RR ***, SpO2 ***, Oxygen Device: ***
  - Important Vital Sign Trends over Past 24 Hours? {Yes... No:40680:::"No"}
  - { Illness Severity:22208:::1}

Unstable	Current clinical status (i.e., vital signs, vital sign trend, or laboratory data) indicates this patient is in need or at high-risk of requiring intensive care unit at BWH (i.e., at high risk of needing pressor support, respiratory support [e.g., non-invasive positive pressure support or intubation] or high nursing needs)
Watcher	Current clinical status (i.e., vital signs, vital sign trend, or laboratory data) that indicates this patient is at moderate-risk of requiring intensive care unit at BWH AND/OR the patient was in the intensive care unit at the transferring hospital within the past 24 hours
Stable	Current clinical status (i.e., vital signs, vital sign trend, or laboratory data) that indicates this patient is at moderate-risk of requiring intensive care unit at BWH AND/OR the patient was in the intensive care unit at the transferring hospital within the past 24 hours

- **PATIENT SUMMARY:**
  - Reason for Transfer: {Blank single:45575:::"Capacity","Continuity of Care","COVID","Higher level of care","Needs procedure","Insurance/Financial","Patient preference","Other"}
  - Brief summary: ***
  - {Is COVID Positive Transfer:49961}
  - Code Status (NOTE: If DNR request MOLST): {PHS AMB CODE STATUS:23801}
- **ACTION ITEMS (NOTE: 1st 24 Hr Needs, deselect those that do NOT apply):** {Blank multiple:19196:::"Nothing anticipated","Consult Service (Specify: ***)","Procedures/Imaging (Specify: ***)","Other"}
- **SYNTHESIS: Please review any questions above that were not yet answered**

Please note the above information is incomplete. Refer to transferring documents for more complete clinical information regarding the transferred patients. Transferring documents can be found in the Media tab, labeled as "Transfer Note". You may find additional clinical information in the following locations:

- *CareEverywhere*
- *Chart Review => Encounters => BWH Admissions => right hand side is timeline of the transfer information and collected data. This may also included additional pieces of clinical information*

Figure 1 Standardised accept note template. *The standardised accept note was implemented as a 'dot-phrase' within the electronic health record (Epic). The note was developed in IPASS format (Illness Severity, Patient Summary, Action Items, Situational Awareness, Synthesis)*[23] *with rearrangement of the data elements to better match the workflow of the Access centre nurses completing the documentation*. Fields marked as '***' indicate areas that require documentation. Fields highlighted in yellow indicate drop-down options within the note template. Blue text within the box includes instructional text to help guide accurate selection of patient illness severity. Black test within the box at the end of the note directs note readers to additional clinical information within the patient electronic medical record. All data fields were developed with input from key stakeholders over the course of 9 months. HCP, Healthcare Proxy; MAR, Medication Administration Record; HR, Heart Rate; BP, Blood Pressure; RR, Respiratory Rate.

- Feasibility of documentation strategies (eg, from the perspective of Access centre nurses) using a priority/pay-off matrix.

Based on multidisciplinary working group input, a draft standardised accept note was created using Illness severity, Patient summary, Action items, Situational awareness, Synthesis by receiver (IPASS) format,[23] given clinician familiarity and use of IPASS among other care transitions within our hospital.[25 26] The IPASS standardised accept note was iteratively refined with group input and additional stakeholder input outside of the working group and converted into a 'dot-phrase' (eg, templated note within Epic EHR) (figure 1).

Of note, in addition to the working group's primary goal of developing a standardised accept note, the generated process map identified that lack of advanced notification of the impending patient transfer was an additional key barrier to the IHT process. Prior work had targeted improving advanced notification of GMS patients for admitting clinicians via implementation of a new workflow for Access Centre nurses to page the admitting clinician at the time that the incoming IHT patient received a bed assignment in the receiving hospital (in advance of arrival).[27] Thus, in addition to implementation of the developed standardised accept note, the decision was made to expand the advanced notification initiative to page the admitting clinician for IHT patients across all services, including cardiology, oncology, and the medical ICU.

Implementation of the standardised accept note

The IPASS standardised accept note was implemented for use within our EHR in July 2021. At the time of implementation, an instructional tutorial was created to guide

users on accessing and documenting the standardised note within the patient's medical record. All access centre nurses (ie, those responsible for coordinating all hospital transfers, conducting a three-way conference call with the transferring and accepting clinicians and for documentation of the accept note at time of patient acceptance for transfer) were trained using this tutorial with oversight from access centre leadership and directed feedback when necessary. Use of the standardised accept note went live for use on GMS and cardiology in July 2021. Use among oncology patients was delayed until November 2021 due to limited staffing within the Access centre to conduct the documentation. Use among ICU patients was delayed until after completion of the study, also due to limited staffing.

Implementation of the expanded advanced notification paging initiative went live across all services (ie, beyond GMS for which it was already in use) in November 2021.

Data collection: primary outcome

The primary outcome was clinician-reported medical errors, obtained via a survey sent to admitting clinicians within 72 hours after IHT patient admission during baseline and intervention time periods (excluding the 1-month wash in period following implementation of the intervention). Admitting clinicians were identified via an administratively generated daily transfer report that listed that day's eligible patients (ie, patients transferred to included services), and the author of the admission History+Physical (ie, H+P) note, indicating the admitting clinician. The transfer report was generated daily Monday through Friday, with Monday's report, including all patient transfers and H+P note authors from the weekend prior. A trained research assistant reviewed the daily report to ensure accuracy of eligible patients and admitting clinicians, and then emailed a survey for each patient transfer to the corresponding admitting clinician via REDCap (Vanderbilt University, Nashville, TN), a free, secure, HIPAA compliant web-based application hosted by MGB. Survey questions were developed based on similar studies[23 28 29] and asked about medical errors experienced by the patient following the transfer, including: unnecessary tests, procedures, medications, fluids or other therapies; delays in tests, procedures, medications, fluids or other therapies; orders written that were erroneous but intercepted before reaching the patient (near misses) or any other medical errors (online supplemental appendix A). The survey was sent daily up to three times via REDCap. After 3 days, any non-responding clinicians were sent a final email by the study principal investigator (SM). Survey respondents were given $5 USD gift cards for each completed survey. The presence of a clinician-reported medical error was defined as an 'yes' response to any of these questions. To obtain our primary outcome of clinician-reported medical error rates, we divided the total number of clinician-reported medical errors by 100 to obtain rates/100 patient transfers.

Secondary outcomes

Secondary outcomes included Clinician-reported failures in communication gathered via the data collection survey (above) and defined as the respondent answering 'yes' to any of the following: receipt of inaccurate patient information; missing important information about the patient; feeling uncertain about management decisions due to lack of clinical information; needing to spend extra time learning about the patient due to lack of clinical information; unable to provide accurate or complete information to the patient, family member or other member of the care team and the patient was more unstable than anticipated based on information received.

Additional secondary outcomes were collected administratively and included: presence of an accept note, defined as the presence of a documented accept note within the patient's medical chart within 3 days of patient admission; 'timeliness' of the accept note, defined as the number of hours between accept note documentation and patient admission; patient rapid response or transfer to the ICU within 24-hours of patient admission, defined as a composite outcome for patients who were initially transferred to non-ICU services at the accepting hospital; patient LOS following transfer and patient in-hospital mortality (ie, death during hospitalisation following transfer).

Covariates

We additionally collected the following variables administratively for use in our adjusted analyses: patient demographics (age, gender, race, ethnicity); patient insurance categorised as Private, Medicare, Medicaid, other; income category by zip code, categorised into quartiles; diagnosis category, using standard ICD-10 grouper algorithms on the principal problem of the Hospital Problem List on admission; patient comorbidity as measured by the Elixhauser score[30]; illness severity as measured by the eCART score on admission, which uses vital sign and laboratory data to predict cardiac arrest, ICU transfer or death among hospitalised patients[31]; clinical service at time of admission; time of year of transfer categorised into quarters to adjust for training effects on residents and seasonal case mix; admitting team census on date of patient admission,[32] to account for clinician work-compression on day of patient transfer; Census of the admitting service on date of patient admission, categorised into 'normal' vs 'extreme' census based on previously defined thresholds by service within the hospital, to account for variations in the hospital's threshold of acceptance for transfer; and hospital COVID-19 census on date of patient admission, defined as the total number of hospitalised patients with COVID-19, to account for pandemic-related spikes in hospitalisation that occurred during data collection periods.

Analysis

Survey response rate was generated throughout and on completion of data collection. We first compared patient

and transfer process characteristics between baseline and intervention patients and additionally between patients admitted by survey responders and patients admitted by survey non-responders.

For primary and secondary outcomes, we conducted a series of univariable then multivariable intention-to-treat analyses to evaluate the association between implementation of the standardised accept note and each outcome, adjusting for all covariates (SAS Statistical Software, Cary, North Carolina), notably using different cohorts depending on the outcome due to specific cohorts included in each outcome (online supplemental appendix B). For our primary outcome (clinician-reported medical error rates), we conducted Poisson regression analyses to evaluate the adjusted association between the standardised accept note implementation and clinician-reported medical error rates. Similar Poisson regression analysis was conducted to evaluate impact on clinician-reported failures in communication. For the outcomes of presence of accept note and in-hospital mortality, we conducted multivariate logistic regression models, including all patients in the cohort; for timeliness of the accept note, we conducted multivariate linear regression; for patient LOS following transfer, we conducted adjusted linear regression with gamma distribution (ie, using log LOS) to account for non-normal distribution (right-skew) of this outcome; and for the composite outcome of rapid-response or ICU transfer within 24 hours of patient admission, we conducted multivariate logistic regression including all patients in the cohort except for those that were initially transferred to ICU services.

Despite notable variation in the implementation of accept note documentation by service (as described in Methods section, implementation among oncology patients was delayed, and implementation among ICU patients did not begin during the study period), we conducted the aforementioned multivariable analyses of primary and secondary outcomes among all services combined on an intention-to-treat basis. We felt that an intention-to-treat analysis was important both due to the expansion of the pre-existing advanced notification initiative that was implemented as a result of the stakeholder work generated by this study as well as due to clinician cross-over between included services (eg, medical residents that rotate across all included services). However, to address the notable variation in implementation, we additionally conducted: (1) an unadjusted stratified analysis of documentation of accept note documentation by service (GMS, cardiology, oncology and ICU) and (2) an intention-to-treat multivariable analyses of primary and secondary outcomes among all services except for ICU service. Two-sided p values <0.05 were considered significant in all analyses.

RESULTS

Among 1658 patient transfers during the study, survey responses were collected on 1197 patient transfers (overall response rate of 72.2%), including 735 out of 1004 patient transfers during the baseline time period (response rate 73.2%) and 462 out of 654 patient transfers during the intervention time period (response rate 70.6%). Patients transferred during the intervention time period had greater comorbidities (higher mean Elixhauser score),[30] were more likely to be transferred to ICU services and less likely to be transferred to services that were in 'extreme census' compared with patients transferred during the baseline period. All other patient and transfer process characteristics were similar between intervention and baseline time periods (table 1). There were no significant differences in patient or transfer process characteristics between patients admitted by survey respondents versus survey non-respondents (data not shown).

Multivariable regression analyses demonstrated that implementation of the standardised accept note was significantly associated with a 27% adjusted relatively lower odds in clinician-reported medical error rates, from 15.8 clinician-reported medical errors/100 patient transfers during the baseline period to 11.5 clinician-reported medical errors/100 patient transfers during the intervention period (aOR 0.73; 95% CI 0.53 to 0.99). Similarly, implementation of the standardised accept note was significantly associated with a 12% reduction in clinician-reported failures in communication; a greater odds of the presence of a documented accept note within the patient's medical chart; improved timeliness of accept note documentation (adjusted absolute difference in time −12.7 hours; 95% CI −9.1 to −16.3); and a 43% reduction in rapid response or ICU transfer with 24 hours of admission. There were no significant differences in adjusted patient LOS following transfer or in-hospital mortality between intervention and baseline time periods (table 2).

In stratified analyses evaluating accept note documentation stratified by service, we demonstrated non-significant increases in documentation among GMS service transfers (42.5% to 52%, p=0.39), significant increase in documentation among oncology service transfers (1.8% to 41.9%, p<0.001) and no change in documentation among cardiology service transfers (68.6% to 66.1%, p=0.51) or ICU service transfers (3.4% to 6.6%, p=0.30). In multivariable regression analyses excluding ICU patient transfers, we found similar results for all outcomes, although the reductions in both clinician-reported medical error rates and failure in communication rates became non-significant (aOR 0.79; 95% CI 0.55 to 1.12 and aOR 0.90; 95% CI 0.78, 1.03).

DISCUSSION

In this study of 1658 medical patient transfers to a large tertiary care hospital, we found that development and implementation of an EHR-based standardised accept note available prior to transfer was associated with significant improvement in presence and timeliness of accept note documentation and a reduction in clinician-reported

Table 1 Patient and transfer process characteristics in baseline and intervention time periods

Characteristic	Baseline (n=1004)	Intervention (n=654)	P-value
Age, mean (SD)	65.8 (14.9)	65.0 (16.1)	0.46
Male sex, n (%)	565 (56.3)	394 (60.2)	0.11
Race/ethnicity, n (%)	830 (82.7)	546 (83.5)	0.89
White non-Hispanic	59 (5.9)	40 (6.1)	
Black non-Hispanic	65 (6.5)	27 (4.1)	
Hispanic	50 (5.0)	41 (6.3)	
**Other*			
Insurance category, n (%)	437 (43.5)	319 (48.8)	0.45
Private	476 (47.4)	269 (41.1)	
Medicare	62 (6.2)	38 (5.8)	
Medicaid	29 (2.9)	28 (4.3)	
†Other			
Annual income category by zip code (in USD), n (%)	249 (24.8)	161 (24.6)	0.44
≤$82 935	260 (25.9)	148 (22.6)	
$82,936–$102 814	239 (23.8)	172 (26.2)	
$102,815–$124 023	244 (24.3)	165 (25.2)	
≥$124 024			
Diagnosis category on admission, n (%)	83 (8.3)	28 (4.3)	0.71
Infectious diseases	383 (38.2)	284 (43.4)	
Diseases of circulatory system	58 (5.8)	31 (4.7)	
Diseases of digestive system	42 (4.2)	37 (5.7)	
Diseases of respiratory system	80 (8.0)	69 (10.6)	
Neoplasms	358 (35.7)	205 (31.4)	
‡Other			
Elixhauser score,[29] mean (SD)	13.8 (10.9)	15.4 (12.0)	**0.01**
eCart score,[30] mean (SD)	36.4 (124.0)	43.6 (140.6)	0.20
Admit service, n (%)	153 (15.2)	25 (3.8)	**<0.001**
Medicine	423 (42.1)	277 (42.4)	
Cardiology	280 (27.9)	184 (28.1)	
Oncology	148 (14.7)	168 (25.7)	
ICU			
Transfer quarter, n (%)	108 (10.8)	67 (10.2)	0.42
Q1 (August–September)	297 (29.6)	205 (31.4)	
Q2 (October–December)	304 (30.3)	211 (32.3)	
Q3 (January–March)	295 (29.4)	171 (26.2)	
Q4 (April–June)			
Team census on date of patient admission, mean (SD)	11.9 (4.1)	11.8 (4.2)	
§Service census on date of patient admission, n (%)	375 (37.4)	325 (49.7)	**<0.001**
Normal census	629 (62.7)	329 (50.3)	
Extreme census			
Hospital COVID census on date of admission, median (SD)	35.3 (30.7)	35.4 (29.2)	0.64

Boldface p-values indicate statistically significant differences between baseline and intervention time periods.
*Other race includes: Asian; other; declined; unavailable || other ethnicity includes: unavailable; other.
†Other insurance categories include: self-pay; international; other government.
‡Other diagnosis categories include: diseases of the blood and blood-forming organs; endocrine, nutritional and metabolic diseases; mental, behavioural and neurodevelopmental diseases; diseases of the nervous system; diseases of the eye and adnexa; diseases of the ear and mastoid process; diseases of the skin and subcutaneous tissue; diseases of the musculoskeletal system and connective tissue; diseases of the genitourinary system; pregnancy, childbirth and the puerperium; certain conditions originating in the perinatal period; congenital malformations, deformations and chromosomal abnormalities; injury, poisoning and certain other consequences of external causes; symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified.
§Service census is categorised into 'normal' vs 'extreme' census based on previously defined thresholds by service within the hospital.
ICU, intensive care unit; Q, quarter.

Table 2 Adjusted association of implementation of a standardised accept note with outcomes

Outcome	Baseline [A](n=735) [B](n=1004) [C](n=856)	Intervention [A](n=462) [B](n=654) [C](n=486)	*Adjusted OR (95% CI)
Primary outcome			
Clinician-reported medical errors/100 patient transfers [A]	15.8	11.5	**0.73 (0.53 to 0.99)**
Secondary outcomes			
Clinician-reported failures in communication [A]	111.6	98.0	**0.88 (0.78 to 0.98)**
Presence of accept note, n (%) [B]	365 (36.4)	284 (43.4)	**2.30 (1.75 to 3.02)**
† Timeliness of accept note (hours), mean (SD) [B]	8.7 (3.1)	21.4 (3.0)	‡ **−12.7 (−9.1 to 16.3)**
LOS (days), mean (SE) [B]	12.2 (0.64)	12.2 (0.71)	‡ 0.1 (−0.08 to 0.09)
Rapid response or ICU transfer, n (%) [C]	69 (8.1)	22 (4.5)	**0.57 (0.34 to 0.97)**
In-hospital mortality [B]	105 (10.5)	82 (12.5)	0.86 (0.57 to 1.29)

A, B, C Different cohorts were used in analyses based on the outcome: A=all patients included with survey responses; B=entire cohort of patients; C=entire cohort of patients, excluding patient initially transferred to ICU services (Appendix). Boldface OR indicate stastically signficant findings.
*Adjusted for: age, gender, race, ethnicity, insurance, diagnosis on admission, comorbidity (Elixhauser score[29]), illness severity (eCart score[30]), clinical service of admission, time of year, admitting team census on date of admission, admitting service census on date of admission, hospital COVID census on date of admission.
†Timeliness of accept note documentation defined as the number of hours between accept note documentation and patient admission (calculated by time of admission – time of accept note documentation).
‡Timeliness of accept note and LOS outcomes show adjusted absolute differences instead of adjusted odds ratio (95% CI).
.ICU, intensive care unit; LOS, length of stay.

medical error rates, clinician-reported failures in communication and clinical decline following transfer (rapid response or ICU transfer). This study contributes to the sparse literature on interventions to improve communication during IHT by providing a rigorous evaluation on both processes and importantly, patient-related outcomes.[33] Existing literature demonstrates that poor communication during IHT is common and is a significant contributor to adverse outcomes.[14 16–18] The standardised accept note developed during this study addresses many of the known deficiencies in communication, likely contributing to the significant improvements observed.

Interestingly, overall fidelity of the intervention was fair, with the presence of an accept note only increasing from 36.4% in the baseline time period to just 43.4% during the intervention time period. However, because accept note documentation was not reliably implemented among ICU patient transfers during the study time period and the proportion of ICU patient transfers significantly increased from baseline to intervention period, this statistic masks a greater increase in accept note documentation among the other services. In particular, accept note documentation increased from 1.8% to 41.9% among oncology patient transfers, despite late adoption of the intervention. Thus, it is possible that improved accept note documentation among this particular patient population, which is both medically complex[34 35] and comprises a high proportion of medical patient transfers, contributed to the observed improvement in outcomes. Additionally, this intervention was associated with improved *timeliness* of availability of an accept note, which likely contributed to these observations. Prior research demonstrates that admitting clinicians often feel underprepared to care for IHT patients at the time of arrival, primarily due to a lack of advanced notification and unavailable clinical information before the patient transfer.[7 20] Thus, improving the availability of the accept note within the EHR in advance of the arrival of the transferred patient may have provided more preparation time to care for that patient on arrival. Additionally, it is likely that the expansion of the advanced notification paging initiative contributed to more preparation time for admitting clinicians in advance of patient arrival. Because this initiative was implemented across all included services within our study period, this may have also contributed to our observed outcomes.

In addition to the improved availability of an accept note, our results suggest that the improved *quality* of the accept note documentation likely contributed to the observed improvement in patient outcomes. We demonstrated that our intervention was associated with a 12% reduction in clinician-reported 'failures in communication', defined as inaccurate or incomplete available clinical information, uncertainty about management decisions due to lack of information, more time required to learn about the patient due to lack of information and/or the patient being more unstable than anticipated based on available information. Prior research suggests that improving communication *quality* during care transitions can improve patient outcomes.[23 36–38] However, these data are primarily related to other types of hospital-based care transitions (eg, intrahospital patient handoffs, patient discharge) and rigorous evaluation of the

impact on patient outcomes is lacking.[33] Of particular note in our study was the observed significant reduction in clinical decline immediately following transfer (rapid response or ICU transfer), suggesting an improvement in mis-triage of IHT patients.

Limitations

Our study is subjected to several limitations. First, this study was limited to medical patient transfers to a single tertiary care hospital, which may limit the generalisability of these findings to other institutions and/or populations of transferred patients (eg, surgical patient transfers, emergency room transfers, direct patient admissions from clinic). However, the standardised accept note developed and implemented addressed previously demonstrated deficiencies in communication during IHT,[7 17–19] and, thus, would likely generate comparable improvements in other similar tertiary care institutions that care for a large volume of transferred patients. Second, the primary outcome evaluated with this intervention was clinician-reported medical errors. Thus, they may be subjected to conscious or unconscious bias, especially because they could not be blinded to the intervention. However, response bias was likely limited as evidenced by our high response rate for the data collection on this outcome (>70%), and demonstration that patient characteristics did not differ between respondents and non-respondents. Recall bias was likely also limited as surveys were sent to admitting clinicians within 72 hours after IHT patient admission. Additionally, prior data suggest high correlation between clinician-reported medical error rates and those captured by other more resource-intensive methodologies (eg, targeted medical record review),[24 29] and the improvement seen in clinician-reported events was accompanied by similar improvements in more objective patient outcomes. Another potential limitation is confounding due to differences in patient populations during the two study periods, as noted in table 1. The entire study was conducted during the COVID-19 pandemic, and we rigorously adjusted for direct effects of the pandemic (proportion of patients with COVID-19 in the hospital, overall patient census as a proxy for ability to accept transfers) and indirect effects of the pandemic on the study population (eg, comorbidity, severity of illness, primary diagnosis, socioeconomic status). Finally, as described above, the fidelity of our implementation was suboptimal, with ineffective implementation of the standardised accept note for ICU patient transfers during the duration of the study and lower than expected rates of implementation across other included services. However, if anything, this would likely bias our results towards the null; thus, we might expect even greater improvements in outcomes had intervention fidelity been higher.

Sustainability

Since its initial implementation during the study period, use of the IPASS accept note had now been disseminated for use across patient transfers to all services within the receiving hospital and is anticipated to be implemented for use across all patient transfers within the healthcare system with the upcoming creation of a merged Access Centre within our healthcare system.

CONCLUSIONS

In summary, we found that development and implementation of a standardised accept note among a large cohort of medical patients undergoing IHT was associated with improvement in presence and timeliness of accept note documentation, clinician-reported medical errors, failures in communication and clinical decline following transfer. Additionally, we demonstrated that implementation of use of the standardised accept note was feasible and able to be successfully disseminated. These results suggest that improving communication during IHT via use of a standardised patient accept note is both feasible and can improve patient outcomes.

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REFERENCES

1 Mueller SK, Zheng J, Orav EJ, *et al*. Rates, predictors and variability of Interhospital transfers: A national evaluation. *J Hosp Med* 2017;12:435–42.

2 Iwashyna TJ. The incomplete infrastructure for Interhospital patient transfer. *Crit Care Med* 2012;40:2470–8.
3 Mehta RH, Stalhandske EJ, McCargar PA, *et al*. Elderly patients at highest risk with acute myocardial infarction are more frequently transferred from community hospitals to tertiary centers: reality or myth *Am Heart J* 1999;138(4 Pt 1):688–95.
4 Iwashyna TJ, Kahn JM, Hayward RA, *et al*. Interhospital transfers among Medicare beneficiaries admitted for acute myocardial infarction at Nonrevascularization hospitals. *Circ Cardiovasc Qual Outcomes* 2010;3:468–75.
5 Roe MT, Chen AY, Delong ER, *et al*. Patterns of transfer for patients with non-ST-segment elevation acute coronary syndrome from community to tertiary care hospitals. *American Heart Journal* 2008;156:185–92.
6 Mueller SK, Zheng J, Orav J, *et al*. Interhospital transfer and receipt of specialty procedures. *J Hosp Med* 2018;13:383–7.
7 Mueller SK, Shannon E, Dalal A, *et al*. Patient and physician experience with Interhospital transfer: A qualitative study. *J Patient Saf* 2021;17:e752–7.
8 Herrigel DJ, Carroll M, Fanning C, *et al*. Interhospital transfer Handoff practices among US tertiary care centers: A descriptive survey. *J Hosp Med* 2016;11:413–7.
9 Forster AJ, Murff HJ, Peterson JF, *et al*. The incidence and severity of adverse events affecting patients after discharge from the hospital. *Ann Intern Med* 2003;138:161–7.
10 Cohen MD, Hilligoss PB. The published literature on Handoffs in hospitals: deficiencies identified in an extensive review. *Qual Saf Health Care* 2010;19:493–7.
11 Riesenberg LA, Leitzsch J, Massucci JL, *et al*. Residents' and attending physicians' Handoffs: a systematic review of the literature. *Acad Med* 2009;84:1775–87.
12 Arora V, Johnson J, Lovinger D, *et al*. Communication failures in patient sign-out and suggestions for improvement: a critical incident analysis. *Qual Saf Health Care* 2005;14:401–7.
13 Sokol-Hessner L, White AA, Davis KF, *et al*. Interhospital transfer patients discharged by academic Hospitalists and general internists: characteristics and outcomes. *J Hosp Med* 2016;11:245–50.
14 Usher M, Sahni N, Herrigel D, *et al*. Diagnostic Discordance, health information exchange, and inter-hospital transfer outcomes: a population study. *J Gen Intern Med* 2018;33:1447–53.
15 Rome BN, Schnipper JL, Maviglia SM, *et al*. Effect of shared electronic health records on duplicate imaging after hospital transfer. *J Gen Intern Med* 2020;35:1617–9.
16 Knudson J. *Streamlining Patient Transfers*. ACP Hospitalist, 2014.
17 Mueller SK. Triaging inter-hospital transfers. In: *WebM&M Cases & Commentaries. 2019, Agency for Helathcare Research and Quality (AHRQ) Patient Safety Network (PSNet*.
18 Reinke CE, Thomason M, Paton L, *et al*. Emergency general surgery transfers in the United States: a 10-year analysis. *J Surg Res* 2017;219:S0022-4804(17)30313-X:128–35.:.
19 Wagner J, Iwashyna TJ, Kahn JM. Reasons underlying Interhospital transfers to an academic medical intensive care unit. *J Crit Care* 2013;28:S0883-9441(12)00246-8:202–8.:.
20 Mueller SK, Schnipper JL. Physician perspectives on Interhospital transfers. *J Patient Saf* 2016.
21 Theobald CN, Choma NN, Ehrenfeld JM, *et al*. Effect of a Handover tool on efficiency of care and mortality for Interhospital transfers. *J Hosp Med* 2017;12:23–8.
22 Usher M*et al*. Harnessing electronic health record inter-Operability to improve inter-hospital transfer outcomes: A pilot study. In: *Society of General Internal Medicine. 2018*. Denver, CO,
23 Starmer AJ, Spector ND, Srivastava R, *et al*. Changes in medical errors after implementation of a Handoff program. *N Engl J Med* 2014;371:1803–12.
24 Starmer AJ, Spector ND, O'Toole JK, *et al*. Implementation of the I-PASS Handoff program in diverse clinical environments: A multicenter prospective effectiveness implementation study. *J Hosp Med* 2023;18:5–14.
25 Berlyand Y, Lee AH-Y, Hasdianda MA, *et al*. Electronic I-PASS: updating the Handoff safety tool through EHR integration and Workflow Enhancement. *NEJM Catalyst* 2023;4:CAT.
26 Coffey M, Thomson K, Li S-A, *et al*. Resident experiences with implementation of the I-PASS Handoff bundle. *J Grad Med Educ* 2017;9:313–20.
27 Mueller S, Murray M, Schnipper J, *et al*. An initiative to improve advanced notification of inter-hospital transfers. *Healthc (Amst)* 2020;8:S2213-0764(20)30021-X.
28 Mueller SK, Yoon C, Schnipper JL. Association of a web-based Handoff tool with rates of medical errors. *JAMA Intern Med* 2016;176:1400–2.
29 Tsilimingras D, Schnipper J, Duke A, *et al*. Post-discharge adverse events among urban and rural patients of an urban community hospital: A prospective cohort study. *J Gen Intern Med* 2015;30:1164–71.
30 Elixhauser A, Steiner C, Harris DR, *et al*. Comorbidity measures for use with administrative data. *Med Care* 1998;36:8–27.
31 Churpek MM, Yuen TC, Winslow C, *et al*. Multicenter development and validation of a risk stratification tool for ward patients. *Am J Respir Crit Care Med* 2014;190:649–55.
32 Mueller SK, Call SA, McDonald FS, *et al*. Impact of resident workload and Handoff training on patient outcomes. *Am J Med* 2012;125:104–10.
33 Abraham J, Kannampallil T, Patel VL. A systematic review of the literature on the evaluation of Handoff tools: implications for research and practice. *J Am Med Inform Assoc* 2014;21:154–62.
34 Pathak P, Dalmacy D, Tsilimigras DI, *et al*. Complications after complex gastrointestinal cancer surgery: benefits and costs associated with inter-hospital transfer among Medicare beneficiaries. *J Gastrointest Surg* 2021;25:1370–9.
35 Suda KJ, Motl SE, Kuth JC. Inpatient oncology length of stay and hospital costs: implications for rising inpatient expenditures. *J Appl Res* 2006;6.
36 Starmer AJ, Sectish TC, Simon DW, *et al*. Rates of medical errors and preventable adverse events among hospitalized children following implementation of a resident Handoff bundle. *JAMA* 2013;310:2262–70.
37 Phillips CO, Wright SM, Kern DE, *et al*. Comprehensive discharge planning with Postdischarge support for older patients with congestive heart failure: a meta-analysis. *JAMA* 2004;291:1358–67.
38 Kripalani S, Jackson AT, Schnipper JL, *et al*. Promoting effective transitions of care at hospital discharge: a review of key issues for Hospitalists. *J Hosp Med* 2007;2:314–23.