RESEARCH ARTICLE

Receiving Providers' Perceptions on Information Transmission During Interfacility Transfers to General Pediatric Floors

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ABSTRACT

BACKGROUND: Pediatric patients can present to a medical facility and subsequently be transferred to a different hospital for definitive care. Interfacility transfers require a provider handoff across facilities, posing risks that may affect patient outcomes.

OBJECTIVES: The goal of this study was to describe the thoroughness of information transmission between providers during interfacility transfers, to describe perceived errors in care at the posttransfer facility, and to identify potential associations between thoroughness of information transmission and perceived errors in care.

METHODS: We performed an exploratory prospective cohort study on communication practices and patient outcomes during interfacility transfers to general pediatric floors. Data were collected from provider surveys and chart review. Descriptive statistics were used to summarize survey responses. Logistic regression was used to analyze the association of communication deficits with odds of having a perceived error in care.

RESULTS: A total of 633 patient transfers were reviewed; 218 transport command physician surveys and 217 frontline provider surveys were completed. Transport command physicians reported higher proportions of key elements being included in the verbal handoff compared with frontline providers. The written key element transmitted with the lowest frequency was a summary document (65.2%), and 13% of transfers had at least 1 perceived error in care. Transfers with many deficits were associated with higher odds of having a perceived error in care.

CONCLUSIONS: Information transmission during pediatric transfers is perceived to be inconsistently complete. Deficits in the verbal and written information transmission are associated with odds of having a perceived error in care.

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Pediatric interfacility transfers are relatively common on a national level. Approximately 9% of nonneonatal pediatric hospitalizations nationally are transfers from another facility.[1] As with other processes requiring a handoff of patient care, interfacility transfers pose risks that may affect patient safety and outcomes.[2,3]

Previous research found increased rates of medical errors among transferred children with chronic conditions.[4] Adult studies have shown that transferred patients have higher levels of adverse events compared with nontransferred patients.[5] Potentially contributing to these errors and adverse events is the patient handoff between providers across facilities. Poor handoff communication is recognized as leading to errors and inefficient care.[6,7] Handoff improvement processes, such as the I-PASS shift change handoff pneumonic, have been created to improve patient safety.[8] However, there is a paucity of medical literature regarding communication during interfacility transfer processes.

The literature on pediatric hospital-based transfers focuses on neonates, critically ill children, and patients in emergency departments.[9–14] Noncritically ill patients may be at increased risk of deficits in provider-to-provider communication and errors in care, compared with critically ill patients, as a result of their perceived reassuring clinical status. Previous research highlights the lack of data on outcomes of transferred patients, the need to study the consequences of communication problems during transfers of noncritically ill patients, and the need to develop guidelines for these transfers.[15]

The objectives of the present study were as follows: (1) to describe the thoroughness of information transmission between providers during interfacility transfers; (2) to describe the prevalence and characteristics of perceived errors in care at the posttransfer facility; and (3) to identify if there is an association between the thoroughness of information transmission and perceived errors in care. We hypothesized that interfacility transfer communication has missing elements in the verbal and written information transmission, that perceived errors in care occur at the posttransfer facility, and that increased deficits in the information transmission are associated with perceived errors in care.

METHODS

We conducted an exploratory prospective cohort study on communication practices and transfer outcomes for pediatric patients who experience an interfacility transfer to a general pediatric floor. We performed a survey of providers and medical chart reviews of the transferred patients.

Description of Hospitals and the Interfacility Transfer Process

The posttransfer hospitals included 2 urban teaching hospitals in Northern California: one 183-bed freestanding children's hospital (Hospital A) and one 129-bed non-freestanding children's hospital (Hospital B). Both hospitals have transfer centers and the capability to use their own pediatric transport teams.

Referring providers initiated a transfer by contacting the transfer center of Hospital A or Hospital B. The transfer center connected the referring provider to a transport command physician. The transport command physician was the physician who received the verbal handoff from the referring provider. This physician was typically the attending physician of the clinical service team who cared for the transferred patient after admission. After receiving the handoff from the referring provider, the transport command physician relayed the verbal handoff to the frontline provider. The frontline provider was the provider who wrote the admission history and physical note. The frontline provider did not communicate directly with the referring provider but instead received information indirectly via the transport command physician. Our survey was limited to the transport command physician and the frontline provider due to practical difficulties in identifying referring provider contact information.

Study Design

Eligibility and Recruitment

Any patient admitted to a general pediatric floor via transfer from a different medical facility's clinic, emergency department, or inpatient unit between February 2015 and February 2016 for Hospital A and between September 2015 and December 2015 for Hospital B was included in the study. Facilities with shared electronic medical record systems under the same ownership were not considered to be a different facility. Patient cases were identified by querying the transfer center databases daily for patients transferred to these 2 hospitals.

Survey Development and Administration

Process and outcome measures were developed to describe the transfer process. Questions were constructed from evidence-based recommendations and expert consensus transfer metrics for adults and critically ill neonates and children,[16–20] shift change handoffs,[8,21] and inpatient–outpatient discharges.[22–25] The survey additionally included questions derived from a qualitative study conducted by the authors.[26]

Verbal and Written Communication Measures

Process measures included the presence of verbal and written information transmission elements. The 7 key verbal handoff elements were as follows: (1) reason for transfer[24] and (2) physical examination findings,[20] as well as the 5 elements that comprise the I-PASS handoff pneumonic[8,21]: (3) illness severity, (4) patient summary, (5) action list, (6) situation awareness, and (7) synthesis by the receiver. Five key written information transmission elements evaluated if the posttransfer frontline provider received the following written documents, as applicable to the patient: (1) summary or copy of pertinent images[26]; (2) laboratory tests and studies[21]; (3) reports (eg, operative reports)[22]; (4) medications[21,25]; and (5) patient care summary.[21] Both the transport command physicians and the frontline providers reported on the verbal elements; only the frontline providers reported on the written elements. Frontline providers were also asked if they received an in-person verbal handoff from the transport team upon patient arrival.[26]

Patient Safety and Quality Measures

Subjective outcome measures included if the patient arrived in the anticipated clinical

condition,[26] if the transfer was indicated,[27] and if there were perceived errors in care. These perceived errors in care were defined as having any of the following: adverse event or near miss (unintended consequences of medical care that led to or could have led to patient harm);[21] delay in patient care (patient does not receive a diagnostic or treatment intervention in the time frame in which it is supposed to be delivered);[26,28] repeat laboratory tests or studies due to a preventable reason;[26] or early unplanned interventions within 12 hours of arrival.[29] Specifically, participants were asked: "Did any of the following occur during or after the transfer AND directly or indirectly as result of the transfer?"

Participants were required to answer all survey questions. Although there were no options for communicating uncertainty, participants could select "not applicable." The survey contained optional free response sections for participants to provide additional information. Surveys were e-mailed within 24 hours of the transfer. Completed surveys were returned relatively quickly, with a median turnaround time of 13 hours (25%–75% interquartile range: 2–43 hours).

Medical Chart Review

Patient demographic characteristics were obtained from electronic medical record reviews and included age, sex, primary language, and insurance status. The transfer center databases were used to obtain referring facility and referring provider variables: location type of origin (ie, clinic, emergency department, inpatient unit), freestanding children's designation, and provider specialty and degree. Also recorded was the posttransfer hospital admitting clinical service team (eg, hematology-oncology). Utilization variables included transport distance (driving miles), transport time (hours from initial communication between referring provider and transfer center to patient arrival at posttransfer hospital), transport mode, length of stay, and discharge disposition. All data were directly input into the Research Electronic Data Capture tool.[30]

TABLE 1 Profile of Patient- and Hospital-Level Characteristics for Transferred Pediatric Hospitalizations

Characteristic	Hospital A/Transferred Patients ($N = 546$)	Hospital B/Transferred Patients ($N = 87$)	P^a
Patient characteristics			
Age group, y			.003
0–1	121 (22.2)	27 (31.0)	
2–5	99 (18.1)	17 (19.5)	
6–11	115 (21.1)	26 (29.9)	
12–18	161 (29.5)	17 (19.5)	
19–26	50 (9.2)	0	
Sex			.44
Female	269 (49.3)	39 (44.8)	
Male	277 (50.7)	48 (55.2)	
Primary language			.18
English	440 (80.6)	76 (87.4)	
Non-English	92 (16.8)	11 (12.6)	
Missing	14 (2.6)	0	
Insurance status			.003
Public	378 (69.2)	49 (56.3)	
Nonpublic	149 (27.3)	38 (43.7)	
Missing	19 (3.5)	0	
Hospital characteristics			
Pretransfer location type			<.001
Clinic	31 (5.7)	2 (2.3)	
Emergency department	377 (69.0)	80 (92.0)	
Inpatient unit	136 (24.9)	5 (5.8)	
Missing	2 (0.4)	0	
Pretransfer facility type			.08
Not freestanding children's	505 (92.5)	86 (98.8)	
Freestanding children's	36 (6.6)	1 (1.2)	
Missing	5 (0.9)	0	
Pretransfer provider specialty			<.001
Emergency medicine	271 (49.6)	63 (72.4)	
Pediatrics	174 (31.9)	16 (18.4)	
Family medicine	15 (2.8)	7 (8.0)	
Other	50 (9.2)	0	
Missing	36 (6.6)	1 (1.2)	
Pretransfer provider degree			<.001
MD or DO	516 (94.5)	81 (93.1)	
NP or PA	3 (0.6)	5 (5.8)	
Missing	27 (5.0)	1 (1.2)	
Posttransfer clinical service team			<.001
Hospitalist	285 (52.2)	72 (82.8)	
Hematology-oncology	96 (17.6)	5 (5.8)	
Surgery	34 (6.2)	6 (6.9)	
Gastroenterology	19 (3.5)	2 (2.3)	
Cardiology	20 (3.7)	0	
Other	90 (16.5)	2 (2.3)	
Missing	2 (0.4)	0	

TABLE 1 Continued

Characteristic	Hospital A/Transferred Patients ($N = 546$)	Hospital B/Transferred Patients ($N = 87$)	P[a]
Utilization			
Transport distance, mean (95% CI), miles	92.6 (84.6–100.5)	38.0 (29.6–46.4)	<.001
Transport distance, median (IQR), miles	65 (30–120)	33 (9–44)	
Transport time, mean (95% CI), h	4.6 (4.0–5.1)	6.6 (5.2–7.9)	<.001
Transport time, median (IQR), h	3.1 (2.2–4.9)	4.3 (3.3–6.8)	
Transport mode			<.001
Ground	366 (67.0)	81 (93.1)	
Air	99 (18.1)	5 (5.8)	
Missing	81 (14.8)	1 (1.2)	
Length of stay, mean (95% CI), d	8.4 (6.9–10.0)	2.8 (1.9–3.7)	<.001
Length of stay, median (IQR), d	3.7 (1.8–8.6)	1.4 (1.0–2.4)	
Discharge disposition			.21
Routine home	514 (94.1)	86 (98.8)	
Transfer to acute facility	5 (0.9)	1 (1.2)	
Died	6 (1.1)	0	
Other	21 (3.8)	0	

Data are presented as *n* (%) unless otherwise indicated. DO, Doctor of Osteopathy; IRQ, 25%–75% interquartile range; MD, Doctor of Medicine; NP, nurse practitioner; PA, physician's assistant.

[a] *P* values refer to comparisons between hospital sites. Determined by using χ^2 tests for categorical variables and the Wilcoxon rank-sum test for continuous variables.

Data Analysis

Descriptive statistics were estimated to summarize transferred patient characteristics, survey participant characteristics, and survey responses. For each key verbal and written element, we compared the percentage of transfers that included the key data element between patients with no perceived errors in care and those with ≥1 perceived error in care; *t* tests were used for analysis.

To quantify the communication deficits for each patient transfer, each of the 3 types of information transmission (transport command physician verbal handoff from the referring provider, frontline provider verbal handoff from the transport command physician, and written information transmission) was categorized as having minimal versus many perceived deficits. We defined minimal versus many perceived transport command physician verbal deficits as 0 to 2 vs 3 to 7 missing key elements, respectively; minimal versus many perceived frontline provider verbal deficits was defined as 0 to 4 vs 5 to 7 missing key elements; and minimal versus many perceived written deficits was defined as 0 to 1 vs 2 to 5 missing key elements. These definitions were based on distribution of the data, using the median as the cutoff point.

For each of the 3 types of information transmission, logistic regression was used to analyze the association of amount of communication deficits with the odds of having a perceived error in care. A perceived error in care could be reported by either a transport command physician or a frontline provider. A change in estimates approach was used to reduce variables for the final model.[31] The covariates included before the change in estimates approach were patient demographic characteristics (age, sex, language, insurance), posttransfer clinical service team, and posttransfer Hospital A versus Hospital B. Sensitivity analyses were conducted by using logistic regression models with a continuous predictor variable to capture the communication deficits instead of the dichotomous (ie, minimal, many) predictor variable.

To provide the opportunity for direct comparisons between transport and frontline physician during a single discharge, we conducted a subset analysis for the patient transfers with completed surveys from both the transport command physician and the frontline provider. In this subset analysis, the verbal information transmission, appropriateness of transfer, and perceived errors in care were summarized. Differences were analyzed according to provider role (transport command physician versus frontline provider) by using McNemar's tests. Stata version 13.1 (Stata Corp, College Station, TX) was used for all statistical analysis.[32]

To analyze the free text responses, 1 researcher with qualitative experience reviewed the free text responses to perform open coding, distill open coding results into categories, and conduct focused coding using the categories. Three inpatient pediatricians who were not part of the research team independently reviewed the categorizations to provide feedback. We then described our analysis. The University of California Reliance Registry (institutional review board) approved this study.

RESULTS

A total of 633 patient transfers were reviewed. These transfers represented 152 unique referring facilities. Survey data represented a total of 355 of the 633 patient transfers, with 80 of those transfers having survey data from both the transport command physician and the frontline provider. A total of 218 transport command physician surveys and 217 frontline provider surveys were completed, with an overall response rate of 34% for each group. Individual providers could care for multiple patient transfer cases and thus could complete multiple surveys. Regarding unique individual physician responses, 77 (48%) of 160 transport command physicians and 95 (51%) of 185 frontline providers completed at least 1 survey.

Patients were predominantly transferred from emergency departments (72.2%) and from facilities that were not freestanding children's hospitals (93.4%). The profile of patient- and hospital-level characteristics is shown in Table 1.

Table 2 presents information transmission and perceived safety and quality outcomes

TABLE 2 Survey Responses on Information Transmission and Perceived Safety and Quality Outcomes From Posttransfer Hospital Providers, Presented According to the Provider's Role

Characteristic	Transport Command Physician (n = 218)		Frontline Provider (n = 217)	
	n	%	n	%
Provider characteristics				
Provider title				
Attending	179	82.1	4	1.8
Fellow	38	17.4	6	2.8
Resident	1	0.5	204	94.0
Nurse practitioner or physician assistant	0	—	3	1.4
Verbal information transmission				
Verbal handoff components[a]				
Reason for transfer	206	94.5	186	85.7
Examination findings	200	91.7	110	50.7
Illness severity	173	79.4	124	57.1
Patient summary	156	71.6	158	72.8
Action list	93	42.7	79	36.4
Situation awareness	63	28.9	41	18.9
Synthesis by receiver	118	54.1	51	23.5
None of the above	8	3.7	19	8.8
Receive in-person handoff from the transport team				
Yes	—	—	38	17.5
No	—	—	161	74.2
NA	—	—	18	8.3
Written information transmission[b]				
Pertinent images	—	—	125	76.2
Pertinent laboratories and studies	—	—	162	80.2
Pertinent reports	—	—	106	73.1
Medication list	—	—	138	73.0
Summary document	—	—	129	65.2
Perceived safety and quality outcomes				
Appropriateness of transfer				
Transfer was indicated	207	95.0	192	88.5
Transfer was not indicated	11	5.0	25	11.5
Perceived errors in care				
Any perceived error in care	14	6.4	34	15.7
Adverse event or near miss	0	—	5	2.3
Delay in patient care	7	3.2	19	8.8
Repeat laboratory or study	3	1.4	13	6.0
Early unplanned intervention	4	1.8	6	2.8

P values to compare characteristics between provider roles were not performed because the reported variables do not provide the opportunity for direct comparisons. Data were not collected from the transport command physician for the following variables: Receive in-person handoff from the transport team, Written information transmission. NA, not applicable.

[a] Verbal handoff components included a reason for transfer, examination findings, illness severity assessment, patient summary (summary statement, events leading up to admission, hospital course, ongoing assessment, and active plans), action list (list of "to-do" items or a statement of "nothing to do"), contingency plans (what to do if adverse contingencies occur or an indication that no adverse contingencies were anticipated), and synthesis or read-back by the receiver.

[b] The denominator for the calculation of percent excluded the patient transfers perceived by the providers to be NA for the specified type of written information transmission. For example, providers would select "NA" for pertinent images if a patient had no images performed. As result, the denominator for each written information type was as follows: images, N = 164; laboratory tests and studies, N = 202; reports, N = 145; medication list, N = 189; and summary document, N = 198.

based on survey responses. The majority of transport command physicians were attending physicians (82.1%); nearly all frontline providers were residents (94.0%). For 6 of the 7 key verbal handoff elements, transport command physicians reported higher proportions of the key element being included in the verbal handoff compared with reports from the frontline providers. The key written element transmitted with the lowest frequency to the frontline provider was a summary document (65.2%). Very few patient transfers were reported to have all key elements transmitted, representing 6.8% of transport command physician verbal handoffs, 3.0% of frontline provider verbal handoffs, and 16.0% of written information transmission.

Frontline providers reported that 14.3% of patients arrived in a condition different from what they had anticipated. Among the 25 such transfers with descriptive information about this discrepancy, 16 were described as more well-appearing than anticipated, whereas 9 were more ill-appearing than anticipated. Regarding the appropriateness of the transfer, the majority of transfers were thought to be indicated.

Forty-six (13.0%) of the 355 patient transfers were reported to have a perceived error in care by either the transport command physician or the frontline provider. The most common type of perceived error in care was delay in patient care (Table 2). Adverse outcomes reported included missed therapies resulting in clinical decline (eg, respiratory failure, septic shock) and failure to perform an ordered diagnostic study, resulting in prolonged antibiotic use and prolonged length of stay.

Figure 1A illustrates that for all 7 key verbal elements, transport command physicians reported significantly higher percentages of verbal handoffs containing the key data element among transferred patients with no perceived error in care compared with those with ≥1 perceived error in care. Frontline providers demonstrated this relationship with 2 of the 7 key verbal handoff elements; the remaining elements did not have a significant difference. Figure 1B similarly illustrates that 4 of the 5 key written elements had significantly higher percentages for containing the key

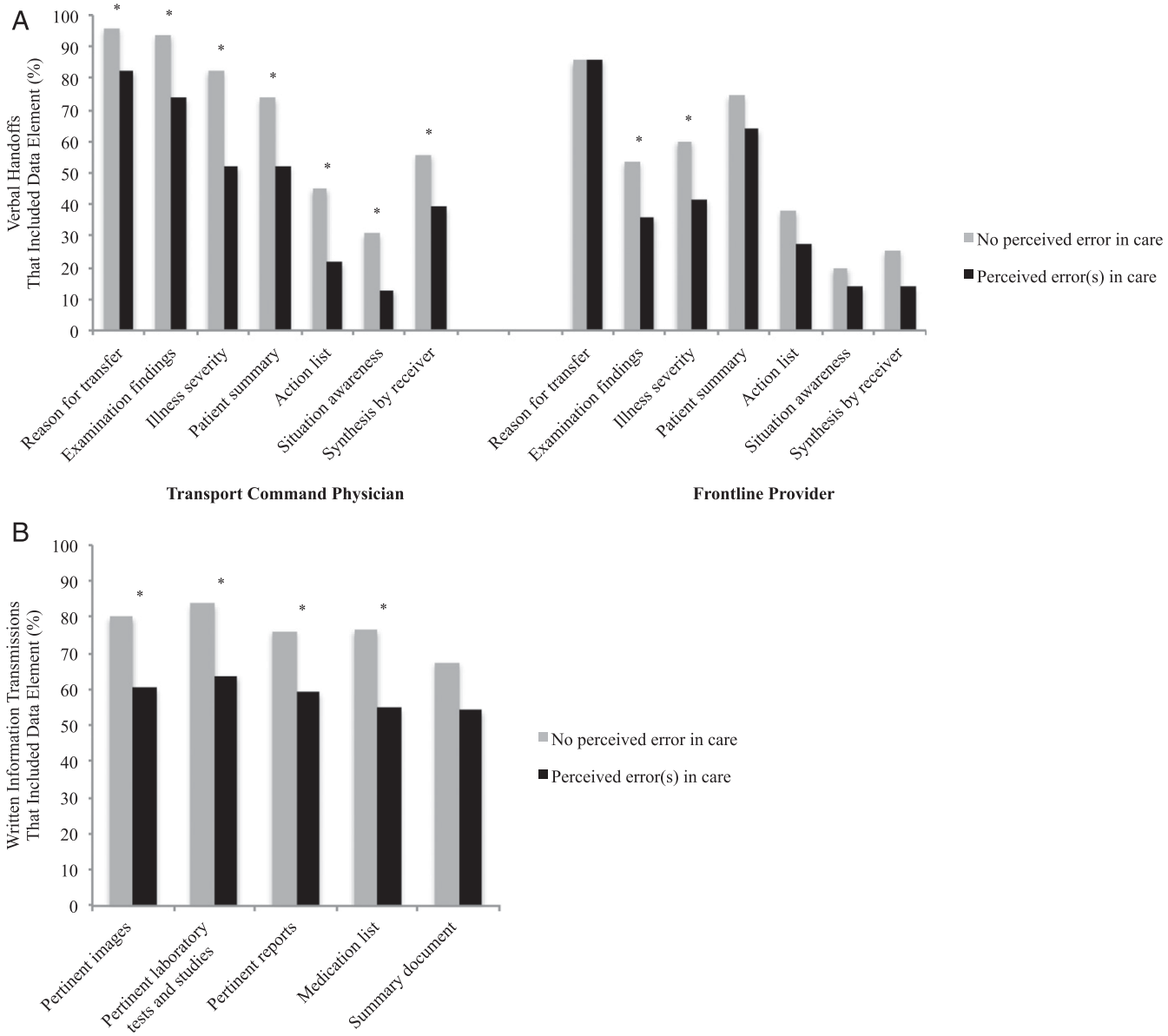

FIGURE 1 A, Percentage of verbal handoffs that included key elements. B, Percentage of written information transmission that included key elements. *P* values were determined by using *t* tests. Perceived errors in care were defined as a transfer with ≥1 of the following reported by either the transport command physician or the frontline provider: adverse event or near miss, delay in patient care, repeat laboratory test or studies, and early unplanned interventions. * $P < .05$.

data element among transferred patients with no perceived error in care compared with those with ≥1 perceived error in care.

Logistic regression revealed various associations between increased communication deficits with higher odds of a perceived error in care (Table 3). In the adjusted analysis, the occurrence of many deficits was associated with higher odds of having ≥1 perceived error in care of any type for the transport command physician verbal handoff (3.8 [95% confidence interval (CI): 1.4–9.9]) and written information transmission (2.5 [95% CI: 1.1–5.6]). The adjusted odds ratio was not significant, however, for the frontline provider verbal handoff (1.4 [95% CI: 0.7–3.0]). None of the included covariates had an association with the outcome. The adjusted analysis results were robust to sensitivity analyses using a continuous predictor variable to represent the communication deficits. Adjusted odds ratios associated with 1 additional communication deficit were as follows: transport command physician verbal handoff, 1.5 (95% CI: 1.2–1.9); frontline provider verbal handoff, 1.2 (95% CI: 1.0–1.5),

TABLE 3 Association Between Amount of Deficits With Having a Perceived Error in Care Rather Than Having No Perceived Error in Care

Variable	Adverse Event or Near Miss	Delay in Patient Care	Repeat Laboratory Test or Study	Early Unplanned Intervention	Any Perceived Error in Care	
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	aOR (95% CI)[a]
Transport command physician verbal handoff[b]						
Minimal deficits	Ref	Ref	Ref	Ref	Ref	Ref
Many deficits	—[c]	2.4 (0.7–8.5)	3.4 (0.6–18.1)	8.4 (1.0–70.9)	3.4 (1.3–8.7)	3.8 (1.4–9.9)
Frontline provider verbal handoff[d]						
Minimal deficits	Ref	Ref	Ref	Ref	Ref	Ref
Many deficits	9.9 (1.1–90.4)	1.6 (0.6–4.2)	1.5 (0.5–4.8)	1.8 (0.4–8.2)	1.6 (0.8–3.4)	1.4 (0.7–3.0)
Written information transmission[e]						
Minimal deficits	Ref	Ref	Ref	Ref	Ref	Ref
Many deficits	2.0 (0.3–12.3)	2.1 (0.8–5.5)	3.8 (1.2–11.8)	1.2 (0.2–6.3)	2.5 (1.2–5.3)	2.5 (1.1–5.6)

Potential deficits represent missing key elements in the verbal or written information transmission. The 7 verbal handoff key elements included: reason for transfer, examination findings, illness severity, patient summary, action list, situation awareness, and synthesis by the receiver. The 5 written key elements included: images, laboratory tests and studies, reports, medication list, and summary document. aOR, adjusted odds ratio; OR, odds ratio.

[a] The logistic regression model for the transport command physician verbal handoff included the covariate age. The logistic regression model for the frontline provider verbal handoff included the covariate posttransfer hospital. The logistic regression model for the written information transmission included the covariates posttransfer clinical service team and posttransfer hospital.

[b] Minimal deficits refers to 0 to 2 missing key elements; many deficits refers to 3 to 7 missing key elements.

[c] Inadequate observations with specified outcome to perform analysis.

[d] Minimal deficits refers to 0 to 4 missing key elements; many deficits refers to 5 to 7 missing key elements.

[e] Minimal deficits refers to 0 to 1 missing key elements; many deficits refers to 2 to 5 missing key elements.

and written information transmission, 1.5 (95% CI: 1.2–1.8).

In the subset analysis of the 80 transfers with completed surveys from both types of provider roles, transport command physicians again reported higher proportions of the key element being included in the verbal handoff compared with the frontline providers for 6 of the 7 key verbal handoff elements (Supplemental Table 4). Content from optional free text responses is presented in Supplemental Table 5 to provide examples of information transmission processes and safety and quality outcomes.

DISCUSSION

The present study provides evidence that verbal and written communication between providers during interfacility transfers to general pediatric floors is inconsistently complete. The very low proportions of patient transfers with complete information transmission show that there is potential for significant improvement. The intended flow of verbal information transmission from the referring provider to the transport command physician, and subsequently from the transport command physician to the frontline provider, demonstrates loss of information, as illustrated by our paired sample. Posttransfer providers report perceived errors in care among transferred patients. Incomplete information transmission is a potential contributor to perceived errors in care.

Although best practices for interfacility transfer communication are lacking, we can draw from other types of transitions of care to extrapolate potential metrics for information transmission.[21,22,25,33] For example, outpatient physicians receiving patients after discharge should receive communication that includes a patient's diagnosis, medications, and study results.[34] During transitions between hospital units, a transition note should be written that includes a problem list with corresponding treatment plans.[25] The transition of providers at shift change should include I-PASS handoff mnemonic elements.[21] Our study showed that such communication processes are inconsistently practiced during interfacility transfers. Further research is needed to develop and validate quality measures specific to interfacility transfers.

The decay of verbal information transmission seen in our study as information was passed from the referring provider to the transport command physician and ultimately to the frontline provider is a pattern consistent with previous research. Simulation of handoffs has shown a consistent loss of information between 1 presenter to the next, with 33% of information lost between the first and third handoffs.[35] Standardizing a transfer protocol, such as with the I-PASS tool, can potentially be a mechanism to prevent information degradation. Having a 3-way call that permits simultaneous communication between the referring provider, transport command physician, and frontline provider is another potential strategy to address this information decay.

Our study suggests that information transmission deficits during transfers are associated with perceived errors in care. This relationship existed for both verbal and written communication. Interestingly, the associations between deficits and perceived errors in care were stronger for the transport command physician verbal handoff compared with the frontline provider verbal handoff. Possibly, the more

experienced transport command physician triages valuable handoff elements and subsequently passes along only the key elements perceived to be important. However, those "less important" missing key elements do not influence the measured outcomes.

Our study provides evidence that additional pediatric interfacility transfer studies should be conducted to verify the association between information transmission deficits and perceived errors in care. We examined the association with established outcomes such as medical errors and preventable adverse events.[21] We propose that future studies investigate the potential association between information transmission and other established quality indicators, such as patient and family experience.[36]

The present study had several limitations. Generalizability is limited because the study included 2 sites in California, although these sites have different characteristics and transfer practices. We did not survey the referring physicians, potentially missing further decay in information transfer. This lack of information from the referring provider also prevents us from understanding the source of incomplete information transmission. We also do not know if the study participants took initiative to gather the information they perceived as incomplete. In addition, participants reported completeness of information transmission, but completeness does not equate to accurate information. Complete but inaccurate information could lead to perceived errors in care, potentially biasing the results to the null. Importantly, the process and outcome measures were based on perceptions of the study participants, and therefore they do not represent objective evidence of events. Recall bias is another limitation with the survey study design. The survey response rate was only 34%, making the concern of selection bias an additional limitation. Potentially, selection bias resulted in an overestimate of perceived errors in care. However, 48% of transport command physicians and 51% of frontline providers completed at least 1 survey, suggesting the low response rate could be partly due to participants previously responding and thus not electing to participate in subsequent surveys. It is possible that the outcomes influenced how participants reported the process measures.

CONCLUSIONS

Verbal and written communication between referring and accepting providers during interfacility transfers to general pediatric floors was perceived by receiving providers to be inconsistently complete. Unfortunately, posttransfer providers also recall adverse safety and quality outcomes significantly more often for patients whose transfer handoffs were perceived to be incomplete. Additional research should be conducted to verify the associations identified in this exploratory study.

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