

Discharge Handoff Communication and Pediatric Readmissions

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BACKGROUND: Improvement in hospital transitional care has become a major national priority, although the impact on children's postdischarge outcomes is unclear.

OBJECTIVE: To characterize common handoff practices between hospital and primary care providers (PCPs), and test the hypothesis that common handoff practices would be associated with fewer unplanned readmissions.

DESIGN, SETTING, AND PATIENTS: This prospective cohort study enrolled randomly selected pediatric patients during an acute hospitalization at a tertiary children's hospital in 2012-2014.

MEASUREMENTS: Primary care and patient data were abstracted from administrative, caregiver, and PCP questionnaires on admission through 30 days postdischarge. The primary outcome was 30-day unplanned readmission to any hospital. Logistic regression assessed relationships between readmissions and 11 handoff communication practices.

RESULTS: We enrolled 701 children, from which 685 identified PCPs. Complete data were collected from 84% of PCPs. Communication practices varied widely—verbal handoffs occurred rarely (10.7%); PCP notification of admission occurred for 50.8%. Caregiver experience scores, using an adapted Care Transitions Measure-3, were high but were unrelated to readmissions. Thirty-day unplanned readmissions to any hospital were unrelated to most handoff practices. Having PCP follow-up appointments scheduled prior to discharge was associated with more readmissions (adjusted odds ratio, 2.20; 95% confidence interval, 1.08-4.46).

CONCLUSION: Despite their presumed value, common handoff practices between hospital providers and PCPs may not lead to reductions in postdischarge utilization for children. Addressing broader constructs like caregiver self-efficacy or social determinants is likely necessary. *Journal of Hospital Medicine* 2017;12:29-35. © 2017 Society of Hospital Medicine

Although much has been written about pediatric discharge and readmissions¹⁻⁵ over the past several years, surprisingly little is known about which care practices are most effective at preventing postdischarge utilization.⁵ Major collaborations across the U.S. are currently focused on improving pediatric discharge processes,⁶⁻⁸ although the impact that these efforts will have on readmissions remains to be seen.

Research on handoffs between hospitals and primary care has mixed associations with postdischarge utilization. Although some studies observe positive relationships between specific activities and reduced postdischarge utilization,¹ others suggest no relationship⁹⁻¹² or, paradoxically, more utilization.^{13,14} Brittan et al¹⁵ found that outpatient visits were associated with more readmissions when occurring less than 4 days after discharge, but fewer readmissions when occurring 4 days to 29 days after discharge. Most studies, however, investigate single or limited sets of care activities, such as having an outpatient visit,¹⁵ timeliness of that visit,¹⁶ or receipt of a discharge summary.¹¹ Inclusion of a more comprehensive

set of hospital- to primary-care communication practices may better unravel this complex relationship between discharge care and postdischarge outcomes for children.

The purpose of this study was to characterize a set of traditional discharge handoff practices between hospital and primary care providers (PCPs) and to explore their relationships to readmissions. We hypothesized that handoff practices would be associated with fewer unplanned readmissions.

METHODS

Study Design, Setting, Participants

This project was part of a prospective cohort study with 2 aims: to investigate relationships between medical home experience and postdischarge utilization,¹⁷ and to identify relationships between common discharge communication practices and postdischarge utilization. This manuscript is focused on the second aim. Randomly selected pediatric patients and their caregivers were enrolled from any medical or surgical service during an acute hospitalization lasting more than 24 hours from October 1, 2012 to January 1, 2014, at a 100-bed tertiary children's hospital. Patients who transferred to another facility, died, were older than 18 years or in neonatal care (ie, newborn nursery or neonatal intensive care unit) were excluded since their discharge experiences would be significantly distinct from the population of interest. Patients were enrolled once in the study.

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Outcome

The study's primary outcome was 30-day unplanned readmissions, defined as a hospitalization occurring within 30 days of the index (ie, study enrollment) hospitalization, identified through caregiver report or administrative sources.¹⁷ Although the study site is a single hospital system, readmissions could have occurred to any hospital reported by caregivers, (ie, readmissions could have occurred within or outside our health system). Readmissions for chemotherapy, radiation, dialysis, rehabilitation, or labor and delivery were excluded. If caregivers reported an admission as planned or chart review of the index discharge summary noted that a rehospitalization was scheduled in the subsequent 30 days, the readmission was labeled "planned" and excluded.

Discharge Handoff Communication

Transitional care is a set of actions designed to ensure continuity and coordination of healthcare during transfer from 1 location or level of care to another.^{18,19} The study team, comprised of a division chief of general pediatrics, a division chief of hospital medicine, 2 departmental vice-chairs, and the medical director for quality at the study site, identified 11 common handoff activities and reporting sources. These consensus-based activities were expected by the study team to improve continuity and coordination during hospital-to-home transfer, and included:

- verifying PCP identity during the hospitalization (caregiver report);
- notifying the PCP of admission, discharge, and providing updates during the hospitalization (PCP report);
- PCP follow-up appointment set prior to discharge (caregiver report);
- documenting planned PCP and subspecialty follow-up in the discharge summary (chart review);
- completing the discharge summary within 48 hours (chart review);
- providing a verbal or written handoff to the PCP prior to follow-up (PCP report); and
- having a PCP follow-up visit within 30 days of discharge (caregiver report).

We also asked PCPs whether they thought the follow-up interval was appropriate and whether phone follow-up with the patient would have been as appropriate as a face-to-face visit.

Covariates

Patient demographics that might confound the relationship between handoff practices and readmissions based on pediatric research^{20,21} were included. Medical complexity was accounted for by length-of-index stay, the number of hospitalizations and emergency department (ED) visits in past 12 months, complex chronic conditions,^{22,23} and seeing 3 or more subspecialists.^{24,25} Variables from related work included PCP scope (general pediatrics or subspecialist) and presence of a usual source for well and sick care.¹⁷

The Care Transitions Measure-3 (CTM-3), originally de-

veloped to assess the patient-centeredness of hospital transition,^{26,27} can discriminate adult patients at risk for readmission.²⁶ We adapted the original CTM-3 to be answered by caregiver respondents after pilot testing with 5 caregivers not enrolled in the study: 1) "The hospital staff took my preferences and those of my family into account in deciding what my child's health care needs would be when I left the hospital;" 2) "When I left the hospital, I had a good understanding of the things I was responsible for in managing my child's health;" and 3) "When I left the hospital, I clearly understood the purpose for giving each of my child's medications." We analyzed the adapted CTM-3 on a transformed 0-100 scale as designed,²⁶ initially hypothesizing that the CTM-3 would mediate the relationship between handoff practices and readmissions.

We assessed caregiver confidence to avoid a readmission, based on a strong independent association with readmissions described in Coller et al.¹⁷ Using questions developed for this study, caregivers were asked to rate "How confident are you that [child's name] will stay out of the hospital for the next 30 days?" with instructions to refer to unplanned hospital visits only. Responses were reported on a 4-point Likert scale (1 = very confident, 4 = not very confident). Responses were dichotomized into very confident (ie, "1") or not very confident (ie, "2-4").

Enrollment and Data Collection

Computer-generated random numbers were assigned to patients admitted the previous day, and families were enrolled sequentially until the daily enrollment target was reached. Data were obtained from 3 sources: medical record, caregiver report, and PCP report. Trained research assistants systematically extracted chart review data documenting the transitions practices above, while a hospital information technology analyst extracted claims and demographic data to complement what was reported by parents and PCPs. After study conclusion, these medical record data were merged with caregiver and PCP-reported data.

Trained bilingual research assistants collected caregiver- and PCP-reported data using structured questionnaires in English or Spanish, according to preference. Timing of data collection differed by data source; caregiver-reported data were collected immediately after discharge and at 30 days postdischarge; PCP-reported data were collected at 30 days postdischarge.

Caregiver-reported data were collected through 2 separate phone calls following index discharge: immediately after discharge (caregiver confidence and CTM-3 measures) and at 30 days (readmission measures). Caregiver confidence questions were asked after (rather than immediately before) discharge to avoid biasing clinical care and revisit risk, consistent with previous work.²⁸

PCP-reported data were collected using structured questionnaires with the PCP who was identified by the family during study enrollment. PCP-reported data were collected by telephone or fax 30 days after discharge, with up to 5 telephone attempts and 3 fax attempts. At the beginning

of the questionnaire, PCPs were asked if they agreed with the designation, although they were asked to complete the questionnaire regardless.

Analyses

Descriptive statistics compared differences in handoff practices and 30-day unplanned readmissions. Exploratory factor analysis assessed whether certain handoff practices were sufficiently correlated to allow grouping of items and construction of scales. Relationships between handoff practices and readmissions were examined using bivariate, followed by multivariate, logistic regression adjusting for the covariates described. Collinearity was tested before constructing final models. Because no relationship was observed between CTM-3 and readmissions, additional mediation analyses were not pursued. All analyses were completed using STATA (SE version 14.0, StataCorp LP, College Station, Texas). This study was approved by the Institutional Review Boards at UCLA (study site) and University of Wisconsin (lead author site).

RESULTS

This study enrolled 701 of 816 eligible participants (85.9%) between October 2012 and January 2014. More than 99% of administrative data and 97% of caregiver questionnaires were complete. Of 685 patients with a reported PCP, we obtained responses from 577 PCPs (84.2%). Patient characteristics and outcomes were not significantly different for patients with and without a responding PCP; however, patients of nonresponding PCPs were more often publicly insured (64.5% vs. 48.2% for responding PCPs, $P = 0.004$) or seen by a subspecialist as opposed to a generalist (28.1% vs. 13.8% for responding PCPs, $P = 0.001$).

The overall population characteristics are summarized in Table 1: 27.4% of the cohort was younger 2 years, 49.2% were Hispanic, and the majority (51.1%) had public insurance. The average length of the index hospitalization for the overall population was 4.8 days (standard deviation = 9.6), and 53.5% had at least 1 complex chronic condition. Eighty-four percent of the cohort reported using a generalist (vs. subspecialist) for primary care.

Discharge Handoff Communication

Practices varied widely (Figure 1a). Verbal handoffs between hospital-based and PCPs were least common (10.7%), whereas discharge summary completion within 48 hours was most common (84.9%). Of variables measuring direct communication with PCPs, only notification of admission occurred at least half the time (50.8%).

Exploratory factor analysis identified 5 well-correlated items (Cronbach $\alpha = 0.77$), which were combined and labeled the Hospital and Primary Care Provider Communication scale (Figure 1b). Items included PCP notification of admission, discharge, and receipt of updates during hospitalization, as well as receipt of verbal and written handoffs prior to follow-up. While these 5 items were analyzed only in this

scale, other practices were analyzed as independent variables. In this assessment, 42.1% of patients had a scale score of 0 (no items performed), while 5% had all 5 items completed

Readmissions

The 30-day unplanned readmission rate to any hospital was 12.4%. Demographic characteristics were similar in patients with and without an unplanned readmission (Table 1); however, patients with a readmission were more often younger ($P = 0.03$) and used a subspecialist for primary care ($P = 0.03$). Fewer than 60% of those with an unplanned readmission had a usual source of sick and well care compared with 77.5% of those without a readmission ($P < 0.001$). The length of index stay was nearly 4 days longer for those with an unplanned readmission (9.3 days vs. 4.4 days, $P < 0.001$). These patients also had more hospitalizations or ED visits in the past year ($P = 0.002$ and $P = 0.04$, respectively) and saw more subspecialists ($P < 0.001$).

Frequencies of communication practices between those with and without an unplanned readmission are illustrated in Table 2. Nearly three-quarters of caregivers whose chil-

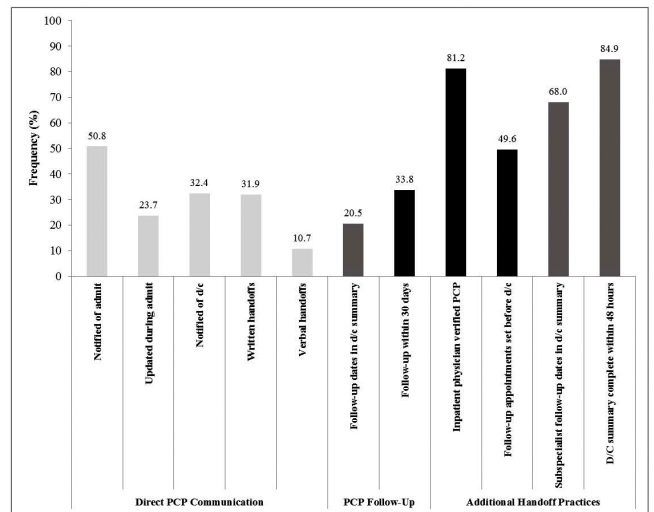


FIG. 1A. Handoff Communication Practices among Children at a Tertiary Children's Hospital^a

^an=701; denominators: n=577 for PCP-report, n=701 for caregiver-report or chart review
NOTE: Shading for data source: black, caregiver-report; light gray, PCP report; dark gray, chart review. Abbreviations: D/C, discharge; PCP, primary care provider.

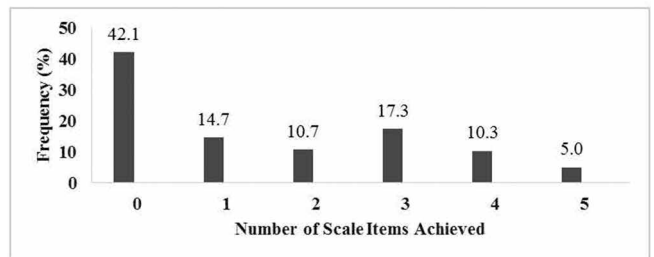


FIG. 1B. Hospital and Primary Care Provider Communication Scale

NOTE: Scale items: PCP notified of admission, PCP provided updates during hospitalization, PCP notified of discharge, verbal handoff received prior to follow-up, written handoff received prior to follow-up. Abbreviation: PCP, primary care provider.

TABLE 1. Pediatric Patient Characteristics and Unplanned Readmissions at a Tertiary Children’s Hospital

	Overall n = 701 n (%)	No Readmission n = 614 n %	Unplanned Readmission n = 87 n %	P
Gender				
Female	303 (43.2)	44.1	37.1	0.30
Age (yr)				
< 2 yr	192 (27.4)	25.8	43.6	0.03
2-5 yr	133 (19.0)	18.8	21.0	
6-10 yr	182 (26.0)	26.8	17.7	
11-14 yr	122 (17.4)	18.2	9.7	
15-18 yr	72 (10.3)	10.5	8.1	
Race/ethnicity				
White, non-Hispanic	235 (33.5)	35.0	21.0	0.22
Black, non-Hispanic	48 (6.9)	6.6	9.7	
Hispanic	343 (49.0)	48.2	59.7	
Other	69 (9.9)	9.9	9.7	
Payer				
Commercial	305 (43.5)	44.3	38.7	0.67
Public	356 (51.1)	50.6	56.5	
Self-pay	36 (5.1)	5.2	4.8	
Hospitalizations, past 12 mo				
None	445 (63.5)	65.5	46.8	0.002
1	118 (16.9)	16.9	17.7	
≥2	134 (19.1)	17.6	35.5	
ED visits, past 12 mo				
None	519 (74.0)	75.8	61.3	0.04
1	87 (12.4)	12.0	17.7	
≥2	91 (13.0)	12.3	21.0	
Length of index stay (d)				
Mean (SD)	4.8 (9.6)	4.4 (9.2)	9.3 (12.1)	<0.001
Complex chronic conditions				
≥ 1 CCC	375 (53.5)	52.6	62.9	0.12
Subspecialists, past 12 mo				
< 3	472 (67.3)	69.3	46.8	<0.001
≥ 3	229 (32.7)	30.7	53.2	
PCP				
Generalist	550 (78.5)	85.2	74.1	0.03
Subspecialist	103 (14.7)	14.8	25.9	
Usual source of sick and well care				
present	543 (77.5)	79.2	59.7	<0.001

NOTE: Significance determined by χ^2 tests for differences in proportions or *t*-tests for differences in means. Abbreviations: CCC complex chronic condition; ED, emergency department; PCP, primary care provider; SD, standard deviation.

dren were readmitted reported having follow-up appointments scheduled before discharge, compared to 48.9% without a readmission ($P < 0.001$). In 71% of discharges followed by a readmission, caregivers were not very confident about avoiding readmission, vs. 44.8% of discharges with no readmission ($P < 0.001$).

Readmissions were largely unrelated to handoff practices in multivariate analyses (Table 3). Having a follow-up visit scheduled prior to discharge was the only activity with a statistically significant association; however, it was actually as-

sociated with more than double the odds of readmission (adjusted odds ratio 2.20, 95% confidence interval 1.08-4.46).

DISCUSSION

The complex nature of hospital discharge care has led to general optimism that improved handoff processes might reduce readmissions for pediatric patients. Although the current literature linking transition practices to readmissions in pediatrics has mixed results,^{1,4,5} most studies are fragmented—investigating a single or small number of transitional care activities, such as outpatient follow-up visits, postdischarge caregiver phone calls, or PCP receipt of discharge summaries. Despite finding limited relationships with readmissions, a strength of our study was its inclusion of a more comprehensive set of traditional communication practices that the study team anticipates many primary care and hospital medicine providers would expect to be carried out for most, if not all, patients during the hospital-to-home transition.

Although our study was developed earlier, the variables in our analyses align with each domain of the conceptual model for readmission risk proposed by the Seamless Transitions and Re(admissions) Network (STARNet).⁶ This model identifies 7 elements believed to directly impact readmission risk in children: hospital and ED utilization, underlying diseases, ability to care for diseases, access to outpatient care, discharge processes, and discharge readiness. For example, our study included ED and hospital visits in the past year, complex chronic conditions, number of subspecialists, caregiver confidence, having a usual source of care, insurance status, and the 11 consensus-based handoff practices identified by our study team. Therefore, although the included handoff practices we included were a limited set, our models provide a relatively comprehensive analysis of readmission risk, confirming caregiver confidence, usual source of care, and hospitalizations to be associated with unplanned readmissions.

With the exception of having scheduled follow-up appointments before discharge – which was associated with more rather than fewer readmissions—the included care practices were not associated with readmissions. We suspect that these findings likely represent selection bias, with hospital providers taking additional steps in communicating with outpatient providers when they are most concerned about a patient’s vulnerability at discharge, eg, due to severity of illness, sociodemographics, health literacy, access to care, or other factors. Such selection bias could have 2 potential effects: (1) creating associations between the performance of certain handoff practices and higher readmission risk (eg, hospital providers are more likely to set follow-up appointments with the sickest patients who are also most likely to be readmitted, or (2) negating weakly effective communication practices that have small effect sizes. The currently mixed literature suggests that if associations between these handoff practices and postdischarge outcomes exist, they are often opposite to our expectation and likely driven by selection bias. If there are real effects that are hidden by this selection

TABLE 2. Handoff Communication Practices and Unplanned Readmissions at a Tertiary Children's Hospital

	Overall	No Readmission	Unplanned Readmission	P
	n = 701	n = 614	n = 87	
	n (%)	%	%	
PCP responded to study questionnaire	577 (82.3)	82.6	80.5	0.63
Hospital and Primary Care Provider Communication Scale ^a	209 (42.1)	42.1	41.9	0.97
0 items	73 (14.7)	15.0	11.6	
1	53 (10.7)	10.8	9.3	
2	86 (17.3)	17.2	18.6	
3	51 (10.3)	10.1	11.6	
4	25 (5.0)	4.9	7.0	
5 items				
PCP follow-up				
PCP follow-up dates included in discharge summary	144 (20.5)	20.1	27.4	0.18
PCP follow-up occurred within 30 d	237 (33.8)	33.8	33.9	0.83
Additional handoff measures				
Inpatient physicians asked caregivers who was PCP	569 (81.2)	87.5	91.4	0.38
Follow-up appointments scheduled before discharge	348 (49.6)	48.9	73.8	< 0.001
Subspecialty care follow-up dates included in discharge summary	477 (68.0)	67.5	80.7	0.03
Discharge summary completed within 48 hr	595 (84.9)	85.3	88.7	0.47
PCP experience				
Agreed with caregiver-identified designation as PCP	517 (89.6)	89.9	86.3	0.57
Follow-up interval after hospitalization was appropriate ^b	189 (82.9)	81.8	92.0	0.31
Phone call would have been as appropriate as office visit ^b	40 (17.3)	17.5	16.0	0.73
Caregiver experience ^c				
CTM-3 score, mean, SD	83.7 (16.9)	83.6 (16.9)	84.5 (16.4)	0.70
Caregiver confidence				
Not very confident to avoid 30-d unplanned readmission	362 (51.6)	44.8	71.0	< 0.001

^aHospital and Primary Care Provider Communication Scale comprises PCP notified of admission, PCP provided updates during hospitalization, PCP notified of discharge, verbal handoff received prior to follow-up, written handoff received prior to follow-up.

^bAmong patients with a PCP-reported follow-up visit.

^cAdapted from CTM-3, Strongly agree: accounted for caregiver preferences = *The hospital staff took my preferences and those of my family into account in deciding what my child's health care needs would be when I left the hospital.* Responsibilities understood = *When I left the hospital, I had a good understanding of the things I was responsible for in managing my child's health.* Medication purpose understood = *When I left the hospital, I clearly understood the purpose for giving each of my child's medications.*

NOTE: Significance determined by Pearson's χ^2 for differences in proportions or *t*-tests for differences in means. Abbreviations: PCP, primary care provider; SD, standard deviation.

bias, they may be weak or inconsistent.

Recent qualitative research highlights the needs and preferences of caregivers of children with chronic or complex conditions to promote their sense of self-efficacy at discharge.²⁹ Such needs include support from within and beyond the health system, comprehensive discharge education, and written instructions, ultimately leading to confidence and comfort in executing the home-management plan. Consistent with our work,¹⁷ a strong independent relationship between caregiver confidence and postdischarge outcomes remained even after accounting for these conventional handoff activities.

Transitions research in pediatrics has started only recently to move beyond traditional handoff communication between hospital and outpatient providers. Over the last several years, more ambitious conceptualizations of hospital discharge care have evolved² and include constructs such as family-centeredness,^{4,28,29} discharge readiness,³⁰ and social determinants of health.³¹ Interventions targeting these constructs are largely missing from the literature and are greatly needed. If transitions are to have an effect on downstream utilization, their focus likely needs to evolve to address such areas.

Finally, our study underscores the need to identify relevant outcomes of improved transitional care. Although the preventability of postdischarge utilization continues to be debated, most would agree that this should not detract from the importance of high-quality transitional care. The STARNet collaborative provides some examples of outcomes potentially impacted through improved transitional care,⁶ although the authors note that reliability, validity, and feasibility of the measures are not well understood. High-quality transitional care presumably would lead to improvements in patient and family experience and perhaps safer care. Although caregiver experience measured by an adapted CTM-3 was neither a mediator nor a predictor of postdischarge utilization for children in our study, use of more rigorously developed tools for pediatric patients³² may provide a better assessment of caregiver experience. Finally, given the well-described risks of poor communication between hospital and outpatient providers,³³⁻³⁵ safety events may be a better outcome of high-quality transitional care than readmissions. Investment in transitional care initiatives would be well justified if the positive patient, provider, and health system impacts can be better demonstrated through improved outcomes.

TABLE 3. Handoff Communication Practices and Multivariate Associations with Unplanned Readmissions

	Unplanned Readmission
	aOR (95% CI)
Hospital and Primary Care Provider Communication Scale ^a	
0 items	Ref
1	0.94 (0.31-2.83)
2	1.68 (0.52-5.46)
3	1.21 (0.48-3.02)
4	1.15 (0.38-3.49)
5 items	2.66 (0.77-9.21)
Primary care follow-up	
PCP follow-up dates included in discharge summary	0.93 (0.42-2.06)
PCP follow-up occurred within 30 d	0.69 (0.34-1.41)
Additional handoff measures	
Inpatient physicians asked caregivers who was PCP	1.41 (0.49-4.01)
Follow-up appointments scheduled before discharge	2.20 (1.08-4.46)
Subspecialty care follow-up dates included in discharge summary	1.11 (0.51-2.42)
Discharge summary completed within 48 hr	1.05 (0.41-2.67)
Caregiver confidence	
Not very confident about avoiding 30-d unplanned readmission	3.08 (1.51-6.31)

^aPCP communication prior to discharge; PCP notified of admission, PCP provided updates during hospitalization, PCP notified of discharge, verbal handoff received prior to follow-up, written handoff received prior to follow-up.
 NOTE: Regression models also adjusted for gender, age, race/ethnicity, payer, hospitalizations and emergency department visits past 12 months, length of index hospital stay, presence of a complex chronic condition, number of subspecialists in past 12 months, PCP scope of practice (general or subspecialty), and presence of a usual source of sick and well care. Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; PCP, primary care provider; SD, standard deviation.

Future readmissions research should aim to accomplish several goals. Because observational studies will continue to be challenged by the selection biases described above, more rigorously designed and controlled experimental pediatric studies are needed. Family, social, and primary care characteristics should continue to be incorporated into pediatric readmission analyses given their increasingly recognized critical role. These variables, some of which could be modifiable, might represent potential targets for innovative readmission reduction interventions. Recently published conceptual models^{6,29,36} provide a useful starting framework.

Limitations

Because of the observational study design, we cannot draw conclusions about causal relationships between handoff practices and the measured outcomes. The tertiary care single-center nature of the study limits generalizability. Response biases are possible given that we often could not verify accuracy of PCP and caregiver responses. As noted above, we suspect that handoff practices were driven by important selection bias, not all of which could be controlled by the measured patient and clinical characteristics. The handoff practices included in this study were a limited set primarily focused on communication between hospital providers and PCPs. Therefore, the study does not rule out the possibility that other aspects of transitional care may reduce readmissions. Subsequent work investigating innovative

interventions may find reductions in readmissions and other important outcomes. Additionally, not all practices have standardized definitions, eg, what 1 PCP considers a verbal handoff may be different from that of another provider. Although we assessed whether communication occurred, we were not able to assess the content or quality of communication, which may have important implications for its effectiveness.^{37,38}

CONCLUSION

Improvements in handoffs between hospital and PCPs may have an important impact on postdischarge outcomes, but it is not clear that unplanned 30-day readmissions is among them. Efforts to reduce postdischarge utilization, if possible, likely need to focus on broader constructs such as caregiver self-efficacy, discharge readiness, and social determinants of health.

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