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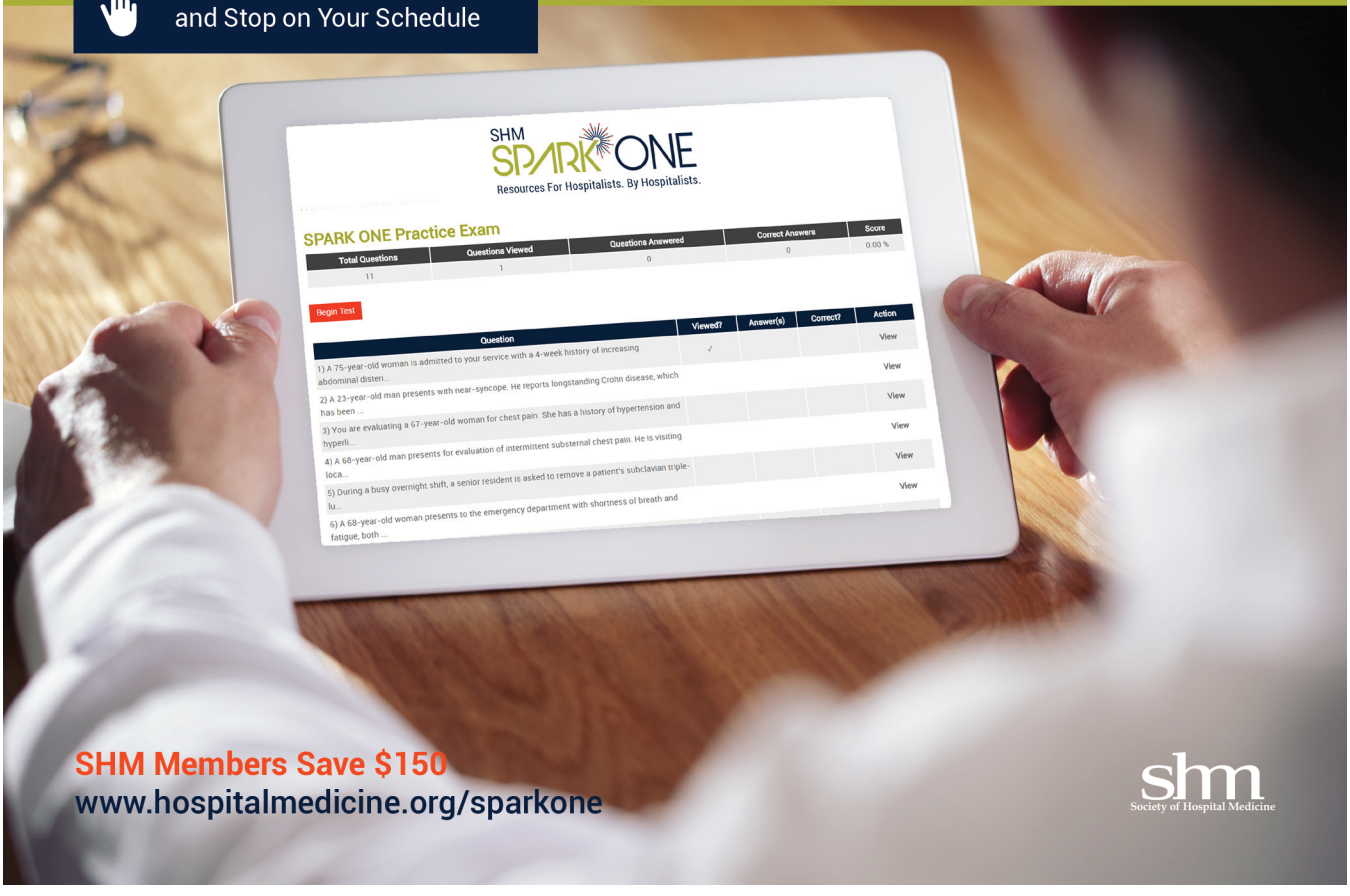

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The Lived Experience of the Hospital Discharge "Plan": A Longitudinal Qualitative Study of Complex Patients

Soo Chan Carusone, PhD[1,2*], Bill O'Leary, MSW[1,3], Simone McWatt, MPH[1], Ann Stewart, MSc, MD[1,4], Shelley Craig, MSW, PhD[3], David J. Brennan, MSW, PhD[3]

[1]Casey House, Toronto, Ontario, Canada; [2]Department of Clinical Epidemiology & Biostatistics, McMaster University, Hamilton, Ontario, Canada; [3]Factor-Inwentash Faculty of Social Work, University of Toronto, Toronto, Ontario, Canada; [4]Department of Family and Community Medicine, University of Toronto, Toronto, Ontario, Canada.

BACKGROUND: Transitions in care are a high-risk time for patients. Complex patients account for the largest proportion of healthcare costs but experience lower quality and discontinuity of care. The experiences of complex patients can be used to identify gaps in hospital discharge practices and design interventions to improve outcomes.

METHODS: We used a case study approach with serial interviews and chart abstraction to explore the hospital discharge and transition experience over 6 weeks. Participants were recruited from a small hospital in Toronto that provides care to complex patients living with human immunodeficiency virus (HIV). Framework analysis was used to compare data across time-points and sources.

RESULTS: Data were collected from 9 cases. Participants presented with complex medical and psychosocial challenges, including substance use (n = 9), mental health diagnoses (n = 8) and a mean of 5 medical comorbidities in addition to HIV. Data were analyzed and reported in 4 key themes: 1) social support; 2) discharge process and transition experience; 3) post-discharge follow-up; and 4) patient priorities. After hospital discharge, the complexity of participants' lives resulted in a change in priorities and subsequent divergence from the discharge plan. Despite the comprehensive discharge plans, with referrals designed to support their health and activities of daily living, participants experienced challenges with social support and referral uptake, resulting in a loss of stability achieved while in hospital.

CONCLUSION: Further investigation and changes in practice are necessary to ensure that discharge plans for complex patients are realistic within the context of their lives outside of the hospital. *Journal of Hospital Medicine* 2017;12:5-10.

Patient complexity is associated with greater hospital readmission rates,[1,2] poorer quality of care,[3] and lower patient satisfaction.[4] Improving outcomes for complex patients is a global priority,[5] and local initiatives such as Ontario's Health Links are being developed, yet evidence to inform care is lacking.[6-8]

The prevalence of patients living with multiple comorbidities is increasing as advances in medicine enable people to live and manage chronic diseases.[9-11] However, these medical gains have resulted in an increased burden on both patients and healthcare systems. Socioeconomic status and co-occurring psychosocial challenges further complicate health and healthcare in marginalized populations.[12,13]

Human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) is one example of a disease that medicine has transformed. Individuals living with HIV today, on antiretroviral medications, may be able to manage their chronic illness for decades.[14,15] However, in addition to social determinants of health that influence ongoing adherence and engagement in care, these medications do not completely eradicate the impact of HIV and, as a result, HIV-positive individuals are at a greater risk of developing additional comorbidities.[15] People living with HIV may, therefore, represent an important patient population in which healthcare interventions and system improvements for complex patients should be explored.

Improving health systems and better supporting complex patients requires a broader understanding of the patient experience and the challenges encountered, especially during high-risk periods such as hospital discharge. Qualitative research approaches are designed to help us understand social phenomena in their "natural" settings,[16] and thus suited to achieve this goal, providing critical insight to inform healthcare systems and policies.[17,18] This study sought to answer the question, "What are the obstacles and challenges faced by complex patients during hospital discharge and post-discharge transition?" We approached patient complexity holistically, using a unified Complexity Framework[6] that connects 5 health dimensions—social capital, mental health, demographics, health and social experiences, and physical health—identified as important to understanding complex patients and their interaction with healthcare. A longitudinal case study approach was used, with multiple sources of data, to understand the clinical context and discharge plans in relation to the lived experience of patients over time, exploring potential misalignment and areas for improvement.

METHODS

This community-based research study was conducted at Casey House, a 13-bed subacute care hospital in Toronto, Can-

***Address for correspondence and reprint requests:** Soo Chan Carusone, 9 Huntley Street, Toronto, ON M4Y 1P2, Canada; Telephone, 416-962-4040, ext 255; Fax, 416-962-5147; E-mail: schancarusone@caseyhouse.on.ca

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ada that provides in-patient and community programs to a complex patient group. All patients are HIV-positive. Inpatient hospital care is provided by an interdisciplinary team, including physicians, social workers, nurses, and healthcare aides. A harm reduction approach is taken to substance use. Twelve beds are for general admission. Patients may be transferred from acute-care hospitals or referred by community-based providers. One bed is reserved for scheduled 2-week respite stays.

The primary research team for this community-based project consisted of clinicians and community and academic researchers. The study was conducted in collaboration with housing, healthcare, and HIV service providers and was advised by 2 individuals with lived experience of discharge from Casey House. Community members with lived experience attended team meetings, provided feedback on all stages of the project (ie, interview guides, recruitment, analysis and dissemination), and helped facilitate community engagement sessions with other patients at the start and the end of the project.

Standard practice for discharge planning involves clinicians determining a tentative discharge date and identifying strategies to support the patient. Planning is informed by knowledge gathered by the interdisciplinary team throughout the admission, including social determinants of health (ie, housing, social support, food security). Patients are encouraged to invite an individual from their social support network to attend a discharge meeting, where the care team reviews goals for admission, course of treatment, referrals, and important follow-up dates.

We used a multi-case study approach to explore the discharge process and post-discharge period. A case was defined as the discharge and transition of a patient from hospital to community. Data were collected through serial interviews with patients (n = 4), medical chart abstraction, and review of discharge summaries. Serial interviews, although not frequently used in clinical research, have been proposed as a strong approach for exploring complex processes and to build trust between researcher and participant,[19] both of which were relevant in this study. Patient interviews were conducted by the Master's trained research coordinator (SM) using tailored semi-structured interview guides for 4 time points: before the discharge meeting (I1); after the discharge meeting but before discharge (I2); within a week of discharge (I3); and approximately 30 days after discharge (I4). Interviews were audio recorded and transcribed verbatim.

Cases were eligible if the patient had a general admission and a planned discharge to the community, and was able to communicate in English and direct his/her own care. Patient-initiated discharges and discharges to another healthcare facility were excluded. Casey House clinical staff approached consecutive potentially eligible patients for their willingness to speak with the researcher coordinator. The research coordinator met with patients to assess eligibility and obtain informed consent to participate. All participants provided informed written consent. The study was approved by the University of Toronto HIV Research Ethics Board.

Interview data, managed with MAXQDA software (VERBI GmbH, Berlin, Germany), were analyzed using a framework analysis approach.[20,21] At least 3 authors read each transcript in its entirety. Priority questions/topics identified *a priori* by stakeholders as important to inform change in care and practices were used as the first draft of the coding framework. The framework was modified through team discussion in the analysis phase to integrate emerging themes. Participant demographic and clinical data were extracted using a structured data collection form.

Preliminary data analysis was completed for the separate data sources including inter- and intra-case comparisons: exploring how experiences and perceptions changed over time and themes that emerged across cases at the same time point. Data sources were combined to strengthen the understanding of the cases and identify relationships and discrepancies across sources.[22] Audit trails, reflexive journaling, group coding and analysis meetings and member-checking, were used to enhance analytical rigor.

RESULTS

The results focus on the patient experience of the "discharge plan" and are presented in terms of 3 pre-identified categories: 1) social support; 2) discharge process and transition experience; and 3) post-discharge follow-up and referrals;

TABLE 1. Participant Characteristics

	N (%)	Mean (Range)
Gender		
Male	5 (56)	
Female	3 (33)	
Trans	1 (11)	
Age (yr)		42 (23-54)
Years living with HIV		15 (1-24)
Receiving financial support/Government disability services	9 (100)	
Average number of comorbidities		5 (2-11)
History of ≥1 Axis 1 diagnoses	8 (89)	
Substance use identified[a]	9 (100)	
Marijuana	8 (89)	
Tobacco	5 (56)	
Crack cocaine	4 (44)	
Benzodiazepine	3 (33)	
Other	4 (44)	
Length of stay (d)		49 (20-87)
Total number of medications at admission		6 (0-19)
Total number of medications at discharge		14 (7-25)
On antiretroviral therapy at admission	4 (44)	
On antiretroviral therapy at discharge	8 (89)	
Case disposition at time of discharge:		
Independent living	5 (56)	
Supportive housing	3 (33)	
Unstable housing/homeless	1 (11)	

[a]Substance use as identified in hospital through urine drug screen and/or self-report.
NOTE: Abbreviations: d, days; HIV, human immunodeficiency virus; yr, years.

and 1 emergent theme, patient priorities.

Participants experienced complex medical and psychosocial challenges (Table 1, participant characteristics). All participants were living with HIV plus a mean of 5 additional comorbidities, the most common being hepatitis C (n = 3), chronic obstructive pulmonary disease (n = 2), herpes (n = 2) and opportunistic infections (n = 2). Eight of 9 participants had a history of an Axis 1 diagnosis, most commonly mood disorder (n = 4). Substance use was identified in all participants. An overview of each case is presented in Table 2.

Three patients declined to be considered for the study. Informed consent was obtained for 10 cases. One participant withdrew after interview 1. Data are presented here for 9 cases, including 32 interviews, between October 2013 and June 2014. Interviews 1 (I1) and 2 (I2) were combined for 3 participants. Two participants were lost to follow-up for interview 4.

Social Support

For the purposes of this paper, we define "social support" as the emotional or instrumental assistance an individual perceives and experiences from people in his/her self-identified network (ie, family, friends). Participants' discharge-related experience of social support did not align, in most cases, with the information from their medical charts or their expectations. At admission, 8 of 9 participants identified at least 1

TABLE 2. Detailed Description by Case

Case/ participant	Gender	Age (range, yr)	Medical comorbidities (N)	Discharge disposition	Medications at admission (N)	Medications at discharge (N)	Referrals at discharge (N)	Strengths and challenges
1[a]	Male	40-50	11	Supportive housing	19	25	8	Participant 1 had significant cognitive impairment. He was on infection control precautions affecting his comfort during the admission. He was excited about freedom of discharge. By I4, his health had declined resulting in missed appointments. He was readmitted during the data collection period.
2	Male	50-60	5	Supportive housing	11	8	6	Participant 2 had a neurodegenerative disorder that had increasing impact on mobility. He had a very difficult transition out of hospital and his health was poor. His health decline prevented him from participating in I4.
4	Female (trans)	20-30	2	Independent living	0	7	5	Participant 4 was motivated to maintain health to achieve personal goals (of continuing gender transition). She had a negative experience with practitioners post-discharge and did not feel supported. Her follow-up was incomplete on some referrals.
5	Female	30-40	5	Independent living	10	14	7	Participant 5 lived outside of the city core making access to services difficult. Follow-ups with referrals were further complicated by mobility challenges and health decline.
6	Male	20-30	4	Supportive housing	11	15	5	Participant 6 suffered from pain issues and complications with obtaining adequate pain medications. He was discharged to supportive housing, which was beneficial. He prioritized supporting his partner resulting in many missed appointments/healthcare visits.
7	Male	50-60	4	Independent living	0	17	8	Participant 7 was excited for discharge and upcoming admission to a drug-treatment program to support his abstinence goals. He started using crack again after discharge and stopped all medications for 2 weeks. He entered a residential rehabilitation program.
8	Female	40-50	2	Unstable housing	0	13	10	Participant 8 was looking forward to discharge but once discharged wanted to be readmitted. She experienced significant health decline after discharge. Challenges with government support caused financial stress. Participant moved a few weeks after discharge and was lost to follow-up for I4.
9[a]	Male	40-50	2	Independent living	0	13	6	Participant 9 was able to maintain health improvements during the data collection period. He had challenges with follow-up including complications with prescription pick-up and negative experiences with healthcare providers post-discharge.
10[a]	Female	50-60	5	Independent living	No data in chart	15	7	Participant 10 was able to follow up with wellness programs and maintained health gains. A major concern during hospitalization was separation from her pet. She suffered from depression and used marijuana as a mood stabilizer. Her goal was to 'stay away' from other substances; however, she reported drug use as a result of depression/ loneliness after discharge.

[a]Participated in a community engagement session during the analysis phase to discuss study findings (member-checking) and next-steps.

NOTE: Abbreviations: yr, years.

person in their social support network, yet only 1 participant had someone attend the discharge meeting. One participant said she had expected "*my daughter, my mother, my brother, somebody. At least somebody. But they never show up*." (P5, I2).

The complexity of her relationship with her family and her unmet needs for support continued after discharge:

> I try and be as independent as possible. I don't have to call them for nothing. Because, even the other day, I called my mom and I asked her, I said, "Mom, I'm going to give you $400 [to pay back a personal loan] and I'm going to give you an extra $100, you could buy me some food." And she goes "Okay." But, I didn't give it to her yet. I don't know, she seems money hungry right now, so I'm like no, I'll wait. (P5, I4)

In the hospital, participants frequently spoke about discharge and transition planning that was inclusive of their social support networks. However, a sense of isolation and loneliness was common post-discharge. Often, friends and family members did not provide the support that participants anticipated, but instead were sources of anxiety and stress. One participant conveyed his experience with a friend he listed as a social support:

> I gave him some money to get me some groceries, to make sure I had some food in the house when I got home. He didn't do that. All of a sudden he was called away to [another city]. He told me his father had a heart attack. He told [others] his father had a slip. I still have yet to receive my money. (P7, I4)

Discharge Process and Transition Experience

While some participants were excited about the thought of freedom of being home, others were anxious about the burdens of returning to life outside of the hospital.

> I kind of feel like, yeah, I want to go home, but then I think to myself what am I going to do when I get home. Am I just going to go back to what I've been doing? Am I going to really change? Am I going to forget to take my pill one day because I'm home and stuff like that. (P4, I1)

The discharge process was often perceived by participants to be rushed. Some participants found the discharge meetings helpful, while others did not feel the process empowered them to engage in a meaningful conversation with hospital staff.

> There was no one there with me to even help me with my brain, to think. But it's afterwards I'm like why didn't I say that, like that's what I meant to say. The brain just doesn't function that way. (P8, I2).

This participant struggled with the transition. One week after discharge when she was asked how her health was she replied:

> Terrible. I've got no energy. I haven't eaten for 3 days. I haven't drank for 3 days. I've got diarrhea galore […] Just no appetite whatsoever. I can't even make it up the stairs without losing my breath. If I make it up the stairs, I have to sit for 15 or 20 minutes… (P8, I3)

The weight of maintaining activities of daily living was prominent in all post-discharge interviews, in many cases accentuated by declining health. The transition to home was more challenging than participants expected; the experience was strongly influenced by the stability of their health, their environment, and the complexity of their lives.

Follow-up and Referrals

Discharge summaries included a mean of 7 referrals. All participants were referred to a case coordinator, nurse, and family physician. Other referrals included pharmacist (n = 8); personal support worker (n = 6); housing (n = 5); and food-support programs (n = 5).

Several factors led to challenges accessing and receiving services. Participants identified: difficulty with requisite paperwork; mobility and financial constraints; personal and logistical challenges with home-care providers; and competing priorities, such as caring for family. These experiences were frequently accompanied by frustration and anxiety.

> Because, if I'm in [city where girlfriend lives], I will not get the support that I get when I'm home. Like my nurse comes. [She] was supposed to come and see me twice and I missed that. I missed like 4 [appointments]. You understand? Certain things I've been missing. (P6, I4)

When one participant was asked if she had followed up with the food support program she had been referred to, she responded:

> Oh, baby, no. I've been so confused. I've had ODSP [referring to Ontario Disability Support Program, a government disability program] on my case. I've got all the files all mixed up. My worker's a real bitch. She hates me, big time. I was supposed to go bring in papers today, but I couldn't get out of bed. I don't know how much trouble I'm going to be in with ODSP now. (P8, I3)

Despite comprehensive discharge plans and referrals, all participants experienced delays and difficulties in accessing and receiving services. In most cases, there was no single contributing factor to these challenges; the unique experiences were a result of the complex interplay of multiple factors for each individual.

Patient Priorities

In the hospital, participants primarily identified goals of improving physical health and medication adherence. However, these goals often shifted to meeting basic living necessities and supporting others upon discharge. Barriers to adequate food and mobility were prominent themes.

One participant spoke about the challenges of supporting her son while struggling with her own health after discharge:

> Well, I've been dying, I can't even walk, and yet I'm the one that still has to go to WalMart, to grab milk and bread for my kid. It's not like I need any of that stuff, because I don't even eat. (P8, I3)

Participants were admitted on a mean of 6 medications and discharged with a mean of 14 (Table 1). In the hospital, medications are dispensed directly to patients; however, maintaining optimal adherence at home was complex.

When 1 participant was asked about her medications after being home for a week, she said:

> My meds, you know I have the cream that I'm supposed to put … and I can't find it. I lost it yesterday. I used it yesterday morning and all day yesterday I'm looking, like, did it fall behind there? But, obviously, I can't look over there [because of mobility challenges] … I don't think I can get it covered [by insurance to replace it]. (P5, I3)

Participants found it difficult to follow a specific dosing schedule, ensure food intake corresponded to medication guidelines, and navigate the impact of substance use. Substance use for some was associated with nonadherence. A participant, explaining his quickly declining health, spoke about the impact of using crack cocaine:

> Yeah, when I use I don't think about medicating, taking my pills or anything like that. That's not even on your mind. It doesn't come across your mind. […] I guess, that's part of the addictive personality. It wants to grab hold of you and say "no, focus on me, focus on me." (P7, I4)

Others used marijuana as an appetite stimulant and a critical piece of their medication adherence routine.

DISCUSSION

This study followed complex patients through hospital discharge and transition back into the community. In the hospital, participants focused on medical goals, but following discharge basic living needs became the priority. Despite a comprehensive plan to provide support upon discharge, participants found executing and following up with referrals, services, and medication adherence was often overwhelming and not achieved in the month post-hospitalization.

Our study provides depth and context to support and understand the findings of reviews evaluating interventions to improve transitions in care.[23,24] A systematic review of interventions to decrease 30-day readmission rates concluded that comprehensive support interventions (with many components) contributed to the greatest reduction in risk of readmission.[16] Components that showed the greatest impact were those that were designed to improve patients' capacity for self-care (including their ability to access and follow through with post-discharge care plans) and those that involved more individuals in the delivery of care.[23]

Our results also support and expand on other qualitative findings of complex patients. Kangovi et al.[25] interviewed patients with low socioeconomic status at a single time point post-discharge to identify common experiences. They summarized their findings in 6 themes: powerlessness during hospitalization; incongruence of patient and clinical team goals; competing issues influencing prominence of health behaviors; socioeconomic constraints on patients' ability to perform recommended behaviors; sense of abandonment after discharge; and loss of self-efficacy resulting from the "failure" to follow the discharge plan. Our findings tell a very similar story but provide the additional context and understanding of the lived experience over time. We found that the transition experience was most challenging when the home environment was unstable, resulting in a shift in priorities from those set during hospitalization.

While increased support may improve outcomes, there is a need to improve awareness, integration, and support for building capacity within complex patients.[26] Capacity is defined here as the sum of resources and abilities that a patient can draw on, and includes physical and mental as well as social, financial, personal, and environmental capabilities and resources.[27] This includes understanding the potential negative impact of developing a clinical plan which, in order to operationalize, requires resources in excess of the patient's capacity at that time.[27] Minimally disruptive medicine, a promising theoretical approach for improving the care of complex clients, embodies the awareness of capacity in achieving patient-centered care while "imposing the smallest possible treatment burden on patients' lives."[28]

This study, although not without its limitations, provides an in-depth exploration of the experiences of a small number of patients living with HIV, recruited from a single facility in Toronto, Canada after relatively long hospital stays. There are specific context issues related to HIV, such as stigma and severe consequences for suboptimal medication adherence. Furthermore, this study took place where many urban health resources exist; complex patients in rural settings or in environments less tailored to the needs associated with complex medical, psychiatric, and social conditions may experience greater barriers in the transition process. Although this study captured data from medical charts and documents relevant to the cases, further exploration of the clinician decision-making process in creating the discharge plans and additional sources of data on health outcomes post-discharge would be beneficial.

Despite its limitations, this study provides detail and depth to understand some of the most complex patients who suffer from significant challenges in the health system and who are amongst the highest-cost healthcare users. The case study approach, with serial interviews, is an important strength of this study, enabling meaningful insight into hospital discharge processes and challenges experienced by complex patients that can inform individual-level care practice and the development of new programs and interventions.

This study builds on recent research with complex patients in calling for a new approach to clinical care.[6,29,30] In order to support complex patients through discharge, clinical goals and referrals must be made in light of a patient's capacity in the community. Structural changes may be made to improve coordination and access to services, decreasing the burden and improving the healthcare experience. Albreht et al.[31] highlight a number of promising programs across Europe (such as the Clinic for Multimorbidity and Polypharmacy in Denmark) designed to improve the health and healthcare for individuals living with multiple chronic conditions. Small-scale changes are also important such as increasing conversations about the capacity and limitations of individuals listed as social supports, and making appropriate and realistic referrals based on an understanding of a patient's ca-

pacity and motivation for follow-up. Shippee et al.[32] identify a list of approaches in line with minimally disruptive medicine that can be integrated into existing systems as part of a developing "toolkit" (eg, elicitation of transcendent patient goals, and integration of patient-reported outcome tracking of challenges and burdens associated with health and daily living). The findings of this study suggest that the elements of the toolkit may provide a foundation for future interventions and research to improve hospital care and discharge outcomes for complex patients.

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Discharges Against Medical Advice at a County Hospital: Provider Perceptions and Practice

Cordelia R. Stearns, MD[1*], Allison Bakamjian, BA[1], Subrina Sattar, MD[1], Miranda Ritterman Weintraub, PhD, MPH[1,2]

[1]Department of Medicine, Highland Hospital, Alameda Health System, Oakland, California; [2]Public Health Program, Touro University, Vallejo, California.

BACKGROUND: Patients discharged against medical advice (AMA) have higher rates of readmission and mortality than patients who are conventionally discharged. Bioethicists have proposed best practice approaches for AMA discharges, but studies have revealed that some providers have misconceptions about their roles in these discharges.

OBJECTIVE: This study assessed patient characteristics and provider practices for AMA discharges at a county hospital and provider perceptions and knowledge about AMA discharges.

DESIGN: This mixed-methods cross-sectional study involved chart abstraction and survey administration.

PARTICIPANTS: Charts were reviewed for all AMA discharges (n = 319) at a county hospital in 2014. Surveys were completed by 178 healthcare providers at the hospital.

RESULTS: Of 12,036 admissions, 319 (2.7%) ended with an AMA discharge. Compared with conventionally discharged patients, patients who left AMA were more likely to be young, male, and homeless and less likely to be Spanish-speaking. Of the AMA patients, 29.6% had capacity documented, 21.4% had medications prescribed, and 25.7% had follow-up arranged. Of patients readmitted within 6 months after AMA, 23.5% left AMA again at the next visit. Attending physicians and trainee physicians were more likely than nurses to say that AMA patients should receive medications and follow-up (94% and 84% vs 64%; $P < 0.05$).

CONCLUSIONS: Although providers overall felt comfortable determining capacity and discussing AMA discharges, they rarely documented these discussions. Nurses and physicians differed in their thinking regarding whether to arrange follow-up for patients leaving AMA, and in practice arrangements were seldom made. *Journal of Hospital Medicine* 2017;12:11-17. © 2017 Society of Hospital Medicine

Patients leave the hospital against medical advice (AMA) for a variety of reasons. The AMA rate is approximately 1% nationally but substantially higher at safety-net hospitals and has rapidly increased over the past decade.[1-5] The principle that patients have the right to make choices about their healthcare, up to and including whether to leave the hospital against the advice of medical staff, is well-established law and a foundation of medical ethics.[6] In practice, however, AMA discharges are often emotionally charged for both patients and providers, and, in the high-stress setting of AMA discharge, providers may be confused about their roles.[7-9]

The demographics of patients who leave AMA have been well described. Compared with conventionally discharged patients, AMA patients are younger, more likely to be male, and more likely a marginalized ethnic or racial minority.[10-14] Patients with mental illnesses and addiction issues are overrepresented in AMA discharges, and complicated capacity assessments and limited resources may strain providers.[7,8,15,16] Studies have repeatedly shown higher rates of readmission and mortality for AMA patients than for conventionally discharged patients.[17-21] Whether AMA discharge is a marker for other prognostic factors that bode poorly for patients or contributes to negative outcomes, data suggest this group of patients is vulnerable, having mortality rates up to 40% higher 1 year after discharge, relative to conventionally discharged patients.[12]

Several models of standardized best practice approaches for AMA have been proposed by bioethicists.[6,22,23] Although details of these approaches vary, all involve assessing the patient's decision-making capacity, clarifying the risks of AMA discharge, addressing factors that might be prompting the discharge, formulating an alternative outpatient treatment plan or "next best" option, and documenting extensively. A recent study found patients often gave advance warning of an AMA discharge, but physicians rarely prepared by arranging follow-up care.[8] The investigators hypothesized that providers might not have known what they were permitted to arrange for AMA patients, or might have thought that providing "second best" options went against their principles. The investigators noted that nurses might have become aware of AMA risk sooner than physicians did but could not act on this awareness by preparing medications and arranging follow-up.

Translating models of best practice care for AMA patients into clinical practice requires buy-in from bedside providers, not just bioethicists. Given the study findings that providers have misconceptions about their roles in the AMA

***Address for correspondence and reprint requests:** Cordelia R. Stearns, MD, Department of Medicine, Highland Hospital, 1411 E 31st St, A2, Oakland, CA 94602; Telephone: 510-437-4763; Fax: 510-437-5134; E-mail: cstearns@alamedahealthsystem.org

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discharge,[7] it is prudent to investigate providers' current practices, beliefs, and concerns about AMA discharges before introducing a new approach.

The present authors conducted a mixed-methods cross-sectional study of the state of AMA discharges at Highland Hospital (Oakland, California), a 236-bed county hospital and trauma center serving a primarily underserved urban patient population. The aim of this study was to assess current provider practices for AMA discharges and provider perceptions and knowledge about AMA discharges, ultimately to help direct future educational interventions with medical providers or hospital policy changes needed to improve the quality of AMA discharges.

METHODS

Phase 1 of this study involved identifying AMA patients through a review of data from Highland Hospital's electronic medical records for 2014. These data included discharge status (eg, AMA vs other discharge types). The hospital's floor clerk distinguishes between absent without official leave (AWOL; the patient leaves without notifying a provider) and AMA discharge. Discharges designated AWOL were excluded from the analyses.

In phase 2, a structured chart review (Appendix A) was performed for all patients identified during phase 1 as being discharged AMA in 2014. In these reviews, further assessment was made of patient and visit characteristics in hospitalizations that ended in AMA discharge, and of providers' documentation of AMA discharges—that is, whether several factors were documented (capacity; predischarge indication that patient might leave AMA; reason for AMA; and indications that discharge medications, transportation, and follow-up were arranged). These visit factors were reviewed because the literature has identified them as being important markers for AMA discharge safety.[6,8] Two research assistants, under the guidance of Dr. Stearns, reviewed the charts. To ensure agreement across chart reviews with respect to subjective questions (eg, whether capacity was adequately documented), the group reviewed the first 10 consecutive charts together; there was full agreement on how to classify the data of interest. Throughout the study, whenever a research assistant asked how to classify particular patient data, Dr. Stearns reviewed the data, and the research team made a decision together. Additional data, for AMA patients and for all patients admitted to Highland Hospital, were obtained from the hospital's data warehouse, which pools data from within the health system.

Phase 3 involved surveying healthcare providers who were involved in patient care on the internal medicine and trauma surgery services at the hospital. These providers were selected because chart review revealed that the vast majority of patients who left AMA in 2014 were on one of these services. Surveys (Appendix B) asked participant providers to identify their role at the hospital, to provide a self-assessment of competence in various aspects of AMA discharge, to voice opinions about provider responsibilities in arranging follow-up for AMA patients, and to make suggestions about the AMA process. The authors designed these surveys, which included questions about aspects of care that have been highlighted in the AMA discharge literature as being important for AMA discharge safety.[6,8,22,23] Surveys were distributed to providers at internal medicine and trauma surgery department meetings and nursing conferences. Data (without identifying information) were analyzed, and survey responses kept anonymous.

The Alameda Health System Institutional Review Board approved this project. Providers were given the option of writing their name and contact information at the top of the survey in order to be entered into a drawing to receive a prize for completion.

We performed statistical analyses of the patient charts and physician survey data using Stata (version 14.0, Stata Corp., College Station, Texas). We analyzed both patient- and encounter-level data. In demographic analyses, this approach prevented duplicate counting of patients who left AMA multiple times. Patient-level analyses compared the demographic characteristics of AMA patients and patients discharged conventionally from the hospital in 2014. In addition, patients with either 1 or multiple AMA discharges were compared to identify characteristics that might be linked to highest risk of recurrent AMA discharge in the hope that early identification of these patients might facilitate providers' early awareness and preparation for follow-up care or hospitalization alternatives. We used ANOVAs for continuous variables and tests of proportions for categorical variables. On the encounter level, analyses examined data about each admission (eg, AMA forms signed, follow-up arrangements made, capacity documented, etc.) for all AMA discharges. We employed chi square tests to identify variations in healthcare provider survey responses. A P value < 0.05 was used as the significance cut-off point.

Staged logistic regression analyses, adjusted for demographic characteristics, were performed to assess the association between risk of leaving AMA (yes or no) and demographic characteristics and the association between risk of leaving AMA more than once (yes or no) and health-related characteristics.

RESULTS

Demographic, Clinical, and Utilization Characteristics

Of the 12,036 Highland Hospital admissions in 2014, 319 (2.7%) ended with an AMA discharge. Of the 8207 individual patients discharged, 268 left AMA once, and 29 left AMA multiple times. Further review of the Admissions, Discharges, and Transfers Report generated from the electronic medical record revealed that 15 AWOL discharges were misclassified as AMA discharges.

Compared with patients discharged conventionally, AMA patients were significantly younger; more likely to be male, to self-identify as Black/African American, and to be English-speaking; and less likely to self-identify as Asian/Pacific Islander or Hispanic/Latino or to be Chinese- or Span-

TABLE 1. Descriptive Characteristics of AMA and Non-AMA Patients at Highland Hospital, 2014

Patient Characteristic	Patient Group				*P*[a]
	AMA (n = 268)		Non-AMA (n = 7939)		
Mean (SD) age, y	44.5	(14.4)	48.5	(18.1)	< 0.001
Female sex, n (%)	71	(26.5)	4137	(52.1)	< 0.001
Race/ethnicity, n (%)					
White	53	(19.9)	1320	(16.8)	0.18
Black	150	(56.4)	2794	(35.6)	< 0.001
Asian/Pacific Islander	23	(8.7)	1130	(14.4)	0.01
Hispanic/Latino	25	(9.4)	1577	(20.1)	< 0.001
Native American	2	(0.8)	39	(0.5)	0.50
Other	13	(4.9)	999	(12.7)	< 0.001
Language, n (%)					
English	248	(92.5)	5394	(68.0)	< 0.001
Spanish	15	(5.6)	1656	(20.9)	< 0.001
Chinese	2	(0.8)	247	(3.1)	0.03
Tagalog	0	(0.0)	78	(1.0)	0.10
Vietnamese	1	(0.4)	99	(1.3)	0.20
Other	2	(0.8)	458	(5.8)	< 0.001
Housing status,[b] n (%)					
Housed	204	(84.0)	—	—	—
Homeless	38	(15.7)	—	—	—
SNF, rehabilitation, long-term care	1	(0.4)	—	—	—
Alcohol use,[b] n (%)					
Current heavy	82	(33.3)	—	—	—
Former heavy	14	(5.7)	—	—	—
Occasional	64	(26.0)	—	—	—
Never	86	(35.0)	—	—	—
Illicit drug use,[b] n (%)					
Current	140	(57.4)	—	—	—
Former	18	(7.4)	—	—	—
Never	86	(35.3)	—	—	—
Mental illness,[b] n (%)					
Depression	48	(17.9)	—	—	—
Bipolar disorder	21	(7.8)	—	—	—
Schizophrenia	10	(3.7)	—	—	—
Dementia	11	(4.1)	—	—	—
Other	1	(0.4)	—	—	—
	17	(6.3)	—	—	—

[a]Tests of proportions and t tests were used to calculate *P* values.

[b]Data not available for non-AMA patients.

NOTE: Abbreviations: AMA, against medical advice; SD, standard deviation; SNF, skilled nursing facility.

ish-speaking (Table 1). They were also more likely than all patients admitted to Highland to be homeless (15.7% vs 8.7%; $P < 0.01$). Multivariate regression analysis revealed persistent age and sex disparities, but racial disparities were mitigated in adjusted analyses (Appendix C). Language disparities persisted only for Spanish speakers, who had a significantly lower rate of AMA discharge, even in adjusted analyses.

The majority of AMA patients were on the internal medicine service (63.5%) or the trauma surgery service (24.8%). Regarding admission diagnosis, 17.2% of AMA patients were admitted for infections, 5.0% for drug or alcohol intoxication or withdrawal, 38.9% for acute noninfectious illnesses, 16.7% for decompensation of chronic disease, 18.4% for injuries or trauma, and 3.8% for pregnancy complications or labor. Compared with patients who left AMA once, patients who left AMA multiple times had higher rates of heavy alcohol use (53.9% vs 30.9%; $P = 0.01$) and illicit drug use (88.5% vs 53.7%; $P < 0.001$) (Table 2). In multivariate analyses, the increased odds of leaving AMA more than once persisted for current heavy illicit drug users compared with patients who had never engaged in illicit drug use.

Discharge Characteristics and Documentation

Providers documented a patient's plan to leave AMA before actual discharge 17.3% of the time. The documented plan to leave had to indicate that the patient was actually considering leaving. For example, "Patient is eager to go home" was not enough to qualify as a plan, but "Patient is thinking of leaving" qualified. For 84.3% of AMA discharges, the hos-

TABLE 2. Patients With 1 or ≥2 AMA Discharges at Highland Hospital, 2014: Descriptive Characteristics and Multivariate Logistic Regression Analyses of Association Between Risk of Leaving AMA ≥2 Times in Calendar Year and Multiple Health-Related Characteristics

	Patient Group				
Patient Characteristic	1 AMA Discharge (n = 239)		≥2 AMA Discharges (n = 29)		Adjusted OR (95% CI)
Demographics					
Mean (SD) age, y	44.7	(14.5)	42.7	(14.2)	1.00 (0.96-1.04)
Female sex (reference = male), n (%)	63	(26.4)	8	(27.6)	1.52 (0.49-4.75)
Race/ethnicity, n (%)					
White (reference)	47	(19.8)	6	(21.4)	1.00
Black	133	(55.9)	17	(60.7)	1.60 (0.29-8.78)
Asian/Pacific Islander	22	(9.2)	1	(3.6)	1.06 (0.08-14.89)
Hispanic/Latino	21	(8.8)	4	(14.3)	2.04 (0.13-32.41)
Native American	2	(0.8)	0	(0.0)	—
Other	13	(5.5)	0	(0.0)	—
Language, n (%)					
English (reference)	221	(92.5)	27	(93.1)	1.00
Spanish	13	(5.4)	2	(6.9)	1.14 (0.05-28.44)
Chinese	2	(0.8)	0	(0.0)	—
Tagalog	0	(0.0)	0	(0.0)	—
Vietnamese	1	(0.4)	0	(0.0)	—
Other	2	(0.8)	0	(0.0)	—
Housing status, n (%)					
Housed (reference)	(84.4)	—	(80.0)	1.00	
Homeless	(15.1)	—	(20.0)	1.80 (0.45-7.17)	
SNF, rehabilitation, long-term care	—	(0.5)	—	(0.0)	—
Health-related characteristics					
Alcohol use, n (%)					
Current heavy	68	(30.9)	14	(53.9)	1.02 (0.33-3.11)
Former heavy	14	(6.4)	0	(0.0)	—
Occasional	62	(28.2)	2	(7.7)	0.10[a] (0.01-0.83)
Never (reference)	(34.6)	10	(38.5)	1.00	
Illicit drug use, n (%)					
Current	117	(53.7)	23	(88.5)	4.48[a] (1.11-18.01)
Former	18	(8.3)	0	(0.0)	—
Never (reference)	83	(38.1)	3	(11.5)	1.00
Mental illness, n (%)					
No (reference)	196	(82.0)	24	(82.8)	1.00
Yes	43	(18.0)	5	(17.2)	0.42 (0.09-2.06)
Depression	18	(7.5)	3	(10.3)	—
Bipolar disorder	10	(4.2)	0	(0.0)	—
Schizophrenia	10	(4.2)	1	(3.4)	—
Dementia	1	(0.4)	0	(0.0)	—
Other	15	(6.3)	2	(6.9)	—

[a] $P < 0.05$.

NOTE: Abbreviations: AMA, against medical advice; CI, confidence interval; OR, odds ratio; SD, standard deviation; SNF, skilled nursing facility.

pital's AMA form was signed and was included in the medical record. Documentation showed that medications were prescribed for AMA patients 21.4% of the time, follow-up was arranged 25.7% of the time, and follow-up was pending arrangement 14.8% of the time. The majority of AMA patients (71.4%) left during daytime hours. In 29.6% of AMA discharges, providers documented AMA patients had decision-making capacity.

Readmission After AMA Discharge

Of the 268 AMA patients, 67.7% were not readmitted within the 6 months after AMA, 24.5% had 1 or 2 readmissions, and the rest had 3 or more readmissions (1 patient had 15). In addition, 35.8% returned to the emergency department within 30 days, and 16.4% were readmitted within 30 days. In 2014, the hospital's overall 30-day readmission rate was 10.8%. Of the patients readmitted within 6 months after AMA, 23.5% left AMA again at the next visit, 9.4% left AWOL, and 67.1% were discharged conventionally.

Drivers of Premature Discharge

Qualitative analysis of the 35.5% of patient charts documenting a reason for leaving the hospital revealed 3 broad, interrelated themes (Figure 1). The first theme, dissatisfaction with hospital care, included chart notations such as "His wife couldn't sleep in the hospital room" and "Not satisfied with all-liquid diet." The second theme, urgent personal issues, included comments such as "He has a very important court date for his children" and "He needed to take care of immigration forms." The third theme, mental health and substance abuse issues, included notations such as "He wants to go smoke" and "Severe anxiety and prison flashbacks."

Provider Self-Assessment and Beliefs

The survey was completed by 178 healthcare providers: 49.4% registered nurses, 19.1% trainee physicians, 20.8% attending physicians, and 10.7% other providers, including chaplains, social workers, and clerks. Regarding self-assessment of competency in AMA discharges, 94% of providers agreed they were comfortable assessing capacity, and 94% agreed they were comfortable talking with patients about the risks of leaving AMA (Figure 2). Nurses were more likely than trainee physicians to agree they knew what to do for patients who lacked capacity (74% vs 49%; $P = 0.02$). Most providers (70%) agreed they usually knew why their patients were leaving AMA; in this self-assessment, there were no significant differences between types of providers.

Regarding follow-up, attending physicians and trainee physicians demonstrated more agreement than nurses that AMA patients should receive medications and follow-up (94% and 84% vs 64%; $P < 0.05$). Nurses were more likely than attending physicians to say patients should lose their rights to hospital follow-up because of leaving AMA (38% vs 6%; $P < 0.01$). A minority of providers (37%) agreed transportation should be arranged. Addiction was the most common driver of AMA discharge (35%), followed by familial obligations (19%), dissatisfaction with hospital care (16%), and financial concerns (15%).

DISCUSSION

The demographic characteristics of AMA patients in this study are similar to those identified in other studies, showing overrepresentation of young male patients.[12,14] Homeless patients were also overrepresented in the AMA discharge population at Highland Hospital—a finding that has not been consistently reported in prior studies, and that warrants further examination. In adjusted analyses, Spanish speakers had a lower rate of AMA discharge, and there were no racial variations. This is consistent with another study's finding: that racial disparities in AMA discharge rates were largely attributable to confounders.[24] Language differences may result from failure of staff to fully explain the option of AMA discharge to non-English speakers, or from fear of immigration consequences after AMA discharge. Further investigation of patient experiences is needed to identify factors that contribute to demographic variations in AMA discharge rates.[25,26]

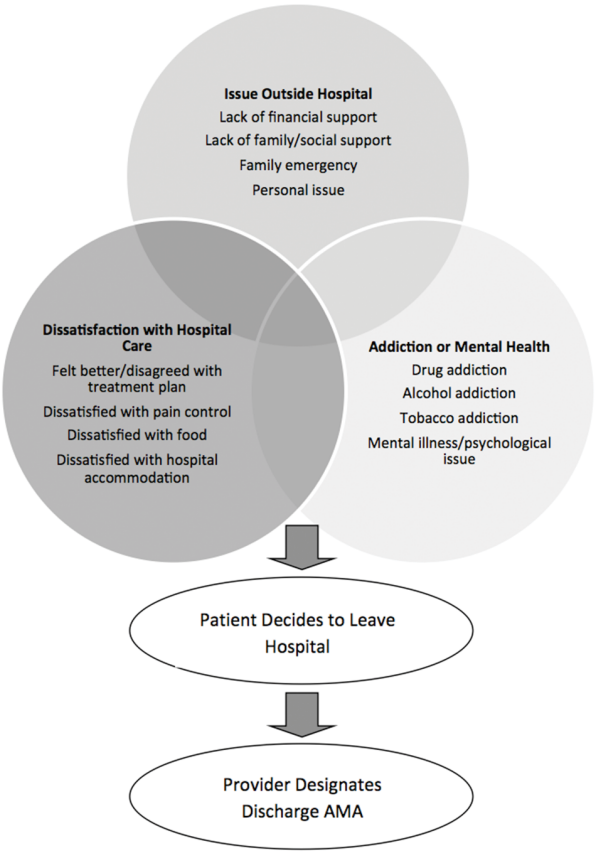

FIG. 1. Qualitative assessment of reasons for premature discharge. Interrelated themes were derived from open-ended comments in medical record. Abbreviation: AMA, against medical advice.

Of the patients who left AMA multiple times, nearly all were actively using illicit drugs. In a recent study conducted at a safety-net hospital in Vancouver, Canada, 43% of patients with illicit drug use and at least 1 hospitalization left AMA at least once during the 6-year study period.[11] Many factors might explain this correlation—addiction itself, poor pain control for patients with addiction issues, fears about incarceration, and poor treatment of drug users by healthcare staff.[15] Although the medical literature highlights deficits in pain control for patients addicted to opiates, proposed solutions are sparse and focus on perioperative pain control and physician prescribing practices.[27,28] At safety-net hospitals in

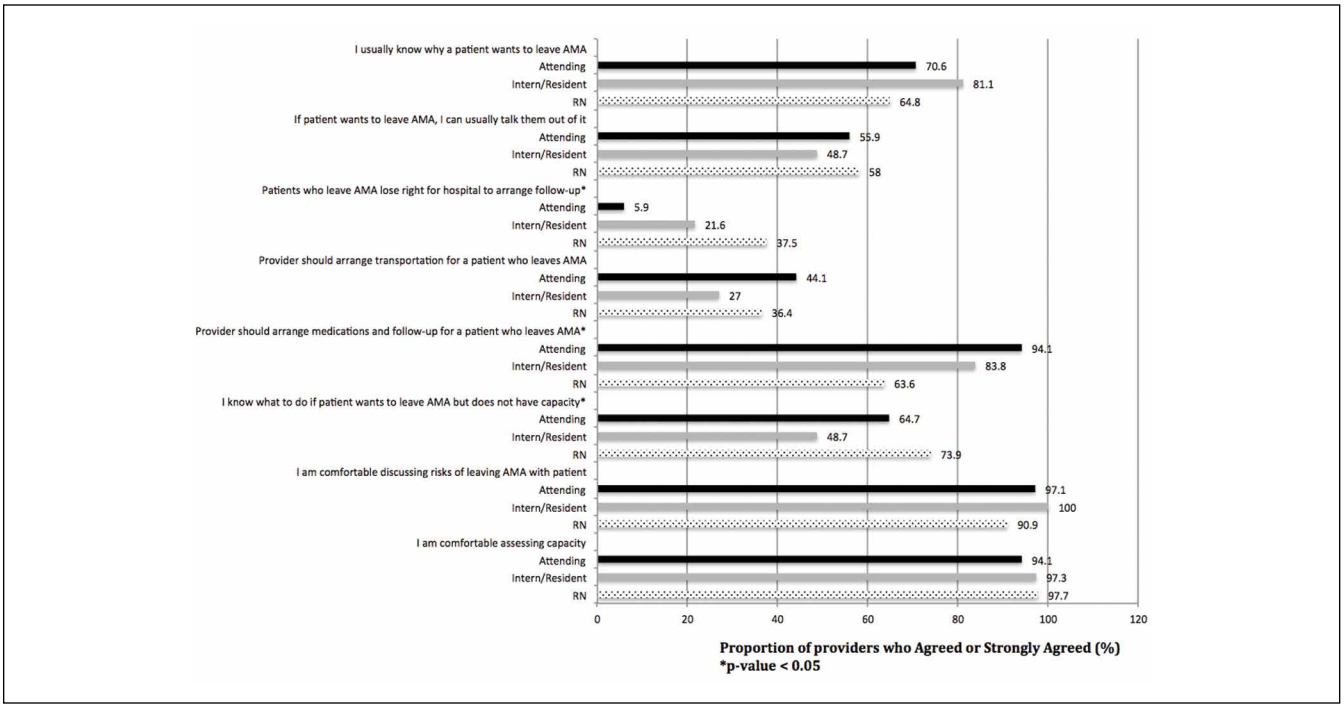

FIG. 2. Results of physician and nurse survey responses. N = 159 (21.4% attending physicians, 23.3% intern/resident physicians, 55.3% registered nurses [RNs]). $P < 0.05$.

which addiction is a factor in many hospitalizations, there is opportunity for new research in inpatient pain control for patients with substance dependence. In addition, harm reduction strategies—such as methadone maintenance for hospitalized patients with opiate dependence and abscess clinics as hospitalization alternatives for injection-associated infection treatment—may be key in improving safety for patients.[11,15,29]

Comparing the provider survey and chart review results highlights discordance between provider beliefs and clinical practice. Healthcare providers at Highland Hospital considered themselves competent in assessing capacity and talking with patients about the risks of AMA discharge. In practice, however, capacity was documented in less than a third of AMA discharges. Although the majority of providers thought medications and follow-up should be arranged for patients, arrangements were seldom made. This may be partially attributable to limited resources for making these arrangements. Average time to "third next available" primary care appointment within the county health system that includes Highland was 44.6 days for established patients during the period of study; for new primary care patients, the average wait for an appointment was 2 to 3 months. Highland has a same-day clinic, but inpatient providers are discouraged from using it as a postdischarge clinic for patients who would be better served in primary care. Medications and transportation are easily arranged during daytime hours but are not immediately available at night. In addition, some of this discrepancy may be attributable to the limited documentation rather than to provider failure to achieve their own benchmarks of quality care for AMA patients.

Documentation in AMA discharges is key for multiple reasons. Most AMA patients in this study signed an AMA form, and it could be that the rate of documenting decision-making capacity was low because providers thought a signed AMA form was adequate documentation of capacity and informed consent. In numerous court cases, however, these forms were found to be insufficient evidence of informed consent (lacking other supportive documentation) and possibly to go against the public good.[30] In addition, high rates of repeat emergency department visits and readmissions for AMA patients, demonstrated here and in other studies, highlight the importance of careful documentation in informing subsequent providers about hospital returnees' ongoing issues.[17-19]

This study also demonstrated differences between nurses and physicians in their beliefs about arranging follow-up for AMA patients. Nurses were less likely than physicians to think follow-up arrangements should be made for AMA patients and more likely to say these patients should lose the right to follow-up because of the AMA discharge. For conventional discharges, nurses provide patients with significantly more discharge education than interns or hospitalists do.[31] This discrepancy highlights an urgent need for the education and involvement of nurses as stakeholders in the challenging AMA discharge process. Although the percentage of physicians who thought they were not obligated to provide medications and arrange follow-up for AMA patients was lower than the percentage of nurses, these beliefs contradict best practice guidelines for AMA discharges,[22,23] and this finding calls attention to the need for interventions

to improve adherence to professional and ethical guidelines in this aspect of clinical practice.

Providers showed a lack of familiarity with practice guidelines regarding certain aspects of the AMA discharge process. For example, most providers thought they should not have to arrange transportation for AMA patients, even though both the California Hospital Association Guidelines and the Highland Hospital internal policy on AMA discharges recommend arranging appropriate transportation.[32] This finding suggests a need for educational interventions to ensure providers are informed about state and hospital policies, and a need to include both physicians and nurses in policymaking so theory can be tied to practice.

This study was limited to a single center with healthcare provider and patient populations that might not be generalizable to other settings. In the retrospective chart review, the authors were limited to information documented in the medical record, which might not accurately reflect the AMA discharge process. As they surveyed a limited number of social workers, case managers, and others who play an important role in the AMA discharge process, their data may lack varying viewpoints.

Overall, these data suggest providers at this county hospital generally agreed in principle with the best practice guidelines proposed by bioethicists for AMA discharges. In practice, however, providers were not reliably following these guidelines. Future interventions—including provider education on best practice guidelines for AMA discharge, provider involvement in policymaking, supportive templates for guiding documentation of AMA discharges, and improving access to follow-up care—will be key in improving the safety and health outcomes of AMA patients.

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Do Clinicians Understand Quality Metric Data? An Evaluation in a Twitter-Derived Sample

Sushant Govindan, MD[1*], Vineet Chopra, MD, MSc[1–3], Theodore J. Iwashyna, MD, PhD[1,2]

[1]Department of Medicine, University of Michigan Health System, Ann Arbor, Michigan; [2]Center for Clinical Management Research, Ann Arbor VA Healthcare System, Ann Arbor, Michigan; [3]Patient Safety Enhancement Program, Ann Arbor VA Medical Center, Ann Arbor, Michigan.

OBJECTIVE: Despite significant efforts and cost, quality metrics do not consistently influence practice. While research has focused on improving data through statistical risk-adjustment, whether clinicians understand these data is unknown. Therefore, we assessed clinician comprehension of central line-associated blood stream infection (CLABSI) quality metric data.

DESIGN: Cross-sectional survey with an 11-item test of CLABSI data comprehension. Each question assessed 1 of 3 concepts concerning CLABSI understanding: basic numeracy, risk-adjustment numeracy, and risk-adjustment interpretation. Hypothetical data were used and presented in a validated format.

PARTICIPANTS: Clinicians were recruited from 6 nations via Twitter to take an online survey. Clinician eligibility was confirmed by assessing responses to a question regarding CLABSI.

MAIN MEASURES: The primary outcome was percent correct of attempted questions pertaining to the presented CLABSI data.

RESULTS: Ninety-seven clinicians answered at least 1 item, providing 939 responses; 72 answered all 11 items. The mean percentage of correct answers was 61% (95% confidence interval [CI], 57%-65%). Overall, doctor performance was better than performance by nurses and other respondents (68% [95% CI, 63%-73%] vs. 57% [95% CI, 52%-62%], $P = 0.003$). In basic numeracy, mean percent correct was 82% (95% CI, 77%-87%). For risk-adjustment numeracy, the mean percent correct was 70% (95% CI, 64%-76%). Risk-adjustment interpretation had the lowest average percent correct, 43% (95% CI, 37%-49%). All pairwise differences between concepts were statistically significant at $P < 0.05$.

CONCLUSIONS: CLABSI quality metric comprehension appears low and varies substantially among clinicians. These findings may contribute to the limited impact of quality metric reporting programs, and further research is needed. *Journal of Hospital Medicine* 2017;12:18-22. © 2017 Society of Hospital Medicine

Central line-associated bloodstream infections (CLABSIs) are common and serious occurrences across healthcare systems, with an attributable mortality of 12% to 25%.[1,2] Given this burden,[3–5] CLABSI is a focus for both high-profile public reporting and quality improvement interventions. An integral component of such interventions is audit and feedback via quality metrics. These measures are intended to allow decision makers to assess their own performance and appropriately allocate resources. Quality metrics present a substantial cost to health systems, with an estimated $15.4 billion dollars spent annually simply for reporting.[6] Despite this toll, "audit and feedback" interventions have proven to be variably successful.[7–9] The mechanisms that limit the effectiveness of these interventions remain poorly understood.

One plausible explanation for limited efficacy of quality metrics is inadequate clinician numeracy—that is, "the ability to understand the quantitative aspects of clinical medicine, original research, quality improvement, and financial matters."[10] Indeed, clinicians are not consistently able to interpret probabilities and or clinical test characteristics. For example, Wegwarth et al. identified shortcomings in physician application of lead-time bias toward cancer screening.[11] Additionally, studies have demonstrated systematic misinterpretations of probabilistic information in clinical settings, along with misconceptions regarding the impact of prevalence on post-test probabilities.[12,13] Effective interpretation of rates may be a key—if unstated—requirement of many CLABSI quality improvement efforts.[14–19] Our broader hypothesis is that clinicians who can more accurately interpret quality data, even if only from their own institution, are more likely to act on it appropriately and persistently than those who feel they must depend on a preprocessed interpretation of that same data by some other expert.

Therefore, we designed a survey to assess the numeracy of clinicians on CLABSI data presented in a prototypical feedback report. We studied 3 domains of comprehension: (1) basic numeracy: numerical tasks related to simple data; (2) risk-adjustment numeracy: numerical tasks related to risk-adjusted data; and (3) risk-adjustment interpretation: inferential tasks concerning risk-adjusted data. We hypothesized that clinician performance would vary substantially across domains, with the poorest performance in risk-adjusted data.

***Address for correspondence and reprint requests:** Sushant Govindan, MD, Taubman Center, Floor 3 Room 3920, 1500 East Medical Center Drive, SPC 5360, Ann Arbor, MI 48109; Telephone: 734-763-9077; Fax: 734-764-4556; E-mail: sushantg@med.umich.edu

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METHODS

We conducted a cross-sectional survey of clinician numeracy regarding CLABSI feedback data. Respondents were also asked to provide demographic information and opinions regarding the reliability of quality metric data. Survey recruitment occurred on Twitter, a novel approach that leveraged social media to facilitate rapid recruitment of participants. The study instrument was administered using a web survey with randomized question order to preclude any possibility of order effects between questions. The study was deemed Institutional Review Board exempt by the University of Michigan: protocol HUM00106696.

Data Presentation Method

To determine the optimal mode of presenting data, we reviewed the literature on quality metric numeracy and presentation methods. Additionally, we evaluated quality metric presentation methods used by the Centers for Disease Control and Prevention (CDC), Centers for Medicare & Medicaid Services (CMS), and a tertiary academic medical center. After assessing the available literature and options, we adapted a CLABSI data presentation array from a study that had qualitatively validated the format using physician feedback (**Appendix**).[20] We used hypothetical CLABSI data for our survey.

Survey Development

We developed a survey that included an 11-item test regarding CLABSI numeracy and data interpretation. Additional questions related to quality metric reliability and demographic information were included. No preexisting assessment tools existed for our areas of interest. Therefore, we developed a novel instrument using a broad, exploratory approach as others have employed.[21]

First, we defined 3 conceptual categories related to CLABSI data. Within this conceptual framework, an iterative process of development and revision was used to assemble a question bank from which the survey would be constructed. A series of think-aloud sessions were held to evaluate each prompt for precision, clarity, and accuracy in assessing the conceptual categories. Correct and incorrect answers were defined based on literature review in conjunction with input from methodological and content experts (TJI and VC) (see Appendix for answer explanations).

Within the conceptual categories related to CLABSI risk-adjustment, a key measure is the standardized infection ratio (SIR). This value is defined as the ratio of observed number of CLABSI over the expected number of CLABSIs.[22] This is the primary measure to stratify hospital performance, and it was used in our assessment of risk-adjustment comprehension. In total, 54 question prompts were developed and subsequently narrowed to 11 study questions for the initial survey.

The instrument was then pretested in a cohort of 8 hospitalists and intensivists to ensure appropriate comprehension, retrieval, and judgment processes.[23] Questions were revised based on feedback from this cognitive testing to constitute the final instrument. During the survey, the data table was reshown on each page directly above each question and so was always on the same screen for the respondents.

Survey Sample

We innovated by using Twitter as an online platform for recruiting participants; we used Survey Monkey to host the electronic instrument. Two authors (TJI, VC) systematically sent out solicitation tweets to their followers. These tweets clearly indicated that the recruitment was for the purpose of a research study, and participants would receive no financial reward/incentive (Appendix). A link to the survey was provided in each tweet, and the period of recruitment was 30 days. To ensure respondents were clinicians, they needed to first answer a screening question recognizing that central lines were placed in the subclavian site but not the aorta, iliac, or radial sites.

To prevent systematic or anchoring biases, the order of questions was electronically randomized for each respondent. The primary outcome was the percentage correct of attempted questions.

Statistical Analysis

Descriptive statistics were calculated for all demographic variables. The primary outcome was evaluated as a dichotomous variable for each question (correct vs. incorrect response), and as a continuous variable when assessing mean percent correct on the overall survey. Demographic and conceptual associations were assessed via t-tests, chi-square, or Fisher exact tests. Point biserial correlations were calculated to assess for associations between response to a single question and overall performance on the survey.

TABLE 1. Respondent Demographics

	No., n = 97[a] (%)
Country	United States: 68 (85) Other: 12 (15)
Profession	Doctor: 39 (48) Nurse: 31 (39) Other: 11 (13)
Specialty (Doctor)	Internal medicine, pulmonary and critical care: 23 (59) Internal medicine, general medicine/hospitalist medicine: 8 (20) Other[b]: 8 (21)
Seen hospitalized patients in past 12 months	Yes: 77 (96) No: 3 (4)
Years of experience	In training: 7 (9) 1-5: 15 (19) 6-10: 24 (30) 11-20: 20 (25) 21-30: 10 (13) 31-40: 3 (4)
Member of a hospital quality committee	Yes: 31 (39) No: 49 (61)

[a]Not all demographic questions were answered by every respondent.

[b]Other professions (n): physiotherapist (3), occupational therapist (1), nurse practitioner (2), physician assistant (1), infection preventionist (1), researcher (1), quality improvement professional (1), medical technologist (1).

To evaluate the association between various respondent characteristics and responses, logistic regression analyses were performed. An ANOVA was performed to assess the association between self-reported reliability of quality metric data and the overall performance on attempted items. Analyses were conducted using STATA MP 14.0 (College Station, TX); P <0.05 was considered statistically significant.

RESULTS

A total of 97 respondents attempted at least 1 question on the survey, and 72 respondents attempted all 11 questions, yielding 939 unique responses for analysis. Seventy respondents (87%) identified as doctors or nurses, and 44 (55%) reported having 6 to 20 years of experience; the survey cohort also came from 6 nations (Table 1). All respondents answered the CLABSI knowledge filter question correctly.

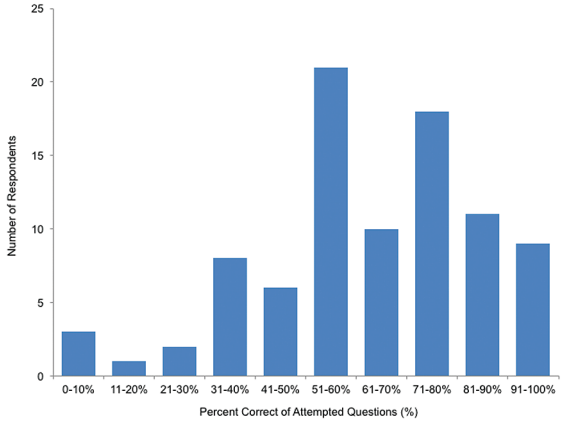

FIG. 1. Percent correct of attempted questions

TABLE 2. CLABSI Numeracy and Interpretation Assessment

Question	Cohort Percent Correct
Basic Numeracy	
Which hospital uses the most central lines?	90%
Which hospital has the lowest CLABSI rate?	80%
If hospital A doubled its central-line use but other practice patterns remained the same, how many actual infections would hospital A expect to have?	79%
If hospital G's number of actual infections doubled, what would its CLABSI rate be?	77%
Risk-Adjustment Numeracy	
Which is better: a higher or lower SIR?	95%
If hospital B had its number of projected infections halved, what is its SIR?	46%
Risk-Adjustment Interpretation	
The presence of a gastrostomy (g) tube is a risk factor for CLABSI. If this variable is not accounted for in CLABSI reporting, how would this impact the interpretation of the number of infections projected by national experience?	75%
Which hospital is most effective at preventing CLABSI?	51%
Suppose hospitals A and H have the exact same CLABSI prevention practices. Which hospital will have the higher number of CLABSI?	34%
Which hospital's patients are the most predisposed to developing CLABSI?	32%
Suppose hospital A begins using a central line with an antibiotic coating that halves infections. What would hospital A's number of projected infections be?	17%

NOTE: All surveys had a randomized order of questions, and the data table was shown directly above each question.
Abbreviations: CLABSI, central line-associated blood stream infection; SIR, standardized infection ratio.

Primary Outcome

The mean percent correct of attempted questions was 61% (standard deviation 21%, interquartile range 50%-75%) (Figure 1). Of those who answered all 11 CLABSI questions, the mean percent correct was 63% (95% CI, 59%-67%). Some questions were answered correctly more often than others—ranging from 17% to 95% (Table 2). Doctors answered 68% of questions correctly (95% CI, 63%-73%), while nurses and other respondents answered 57% of questions correctly (95% CI, 52%-62%) (P = 0.003). Other demographic variables—including self-reported involvement in a quality improvement committee and being from the United States versus elsewhere—were not associated with survey performance. The point biserial correlations for each individual question with overall performance were all more than 0.2 (range 0.24–0.62) and all statistically significant at P < 0.05.

Concept-Specific Performance

Average percent correct declined across categories as numeracy requirements increased (P < 0.05 for all pairwise comparisons). In the area of basic numeracy, respondents' mean percent correct was 82% (95% CI, 77%-87%) of attempted. This category had 4 questions, with a performance range of 77% to 90%. For example, on the question, "Which hospital has the lowest CLABSI rate?", 80% of respondents answered correctly. For risk-adjustment numeracy, the mean percent correct was 70% (95% CI, 64%-76%); 2 items assessed this category. For "Which is better: a higher or lower SIR?", 95% of the cohort answered correctly. However, on "If hospital B had its number of projected infection halved, what is its SIR?", only 46% of those who attempted the question answered correctly.

Questions featuring risk-adjustment interpretation had an average percent correct of 43% (95% CI, 37%-49%). Five questions made up this category, with a percent correct range of 17% to 75%. For example, on the question, "Which hospital's patients are the most predisposed to developing CLABSI?", only 32% of respondents answered this correctly. In contrast, for the question "Which hospital is most effective at preventing CLABSI?", 51% answered correctly. Figure 2 illustrates the cohort's performance on each conceptual category while Table 2 displays question-by-question results.

Opinions Regarding CLABSI Data Reliability

Respondents were also asked about their opinion regarding the reliability of CLABSI quality metric data. Forty-three percent of respondents stated that such data were reliable at best 50% of the time. Notably, 10% of respondents indicated that CLABSI quality metric data were rarely or never reliable. There was no association between perceived reliability of quality metric data and survey performance (P = 0.87).

DISCUSSION

This Twitter-based study found wide variation in clinician interpretation of CLABSI quality data, with low overall performance. In particular, comprehension and interpretation of risk-adjusted data were substantially worse than unadjusted data. Although doctors performed somewhat better than nurses and other respondents, those involved in quality improvement initiatives performed no better than respondents who were not. Collectively, these findings suggest clinicians may not reliably comprehend quality metric data, potentially affecting their ability to utilize audit and feedback data. These results may have important implications for policy efforts that seek to leverage quality metric data to improve patient safety.

An integral component of many contemporary quality improvement initiatives is audit and feedback through metrics.[6] Unfortunately, formal audit and feedback, along with other similar methods that benchmark data, have not consistently improved outcomes.[24–27] A recent meta-analysis noted that audit and feedback interventions are not becoming more efficacious over time; the study further asserted that "new trials have provided little new knowledge regarding key effect modifiers."[9] Our findings suggest that numeracy and comprehension of quality metrics may be important candidate effect modifiers not previously considered. Simply put: we hypothesize that without intrinsic comprehension of data, impetus or insight to change practice might be diminished. In other words, clinicians may be more apt to act on insights they themselves derive from the data than when they are simply told what the data "mean."

The present study further demonstrates that clinicians do not understand risk-adjusted data as well as raw data. Risk-adjustment has long been recognized as necessary to compare outcomes among hospitals.[28,29] However, risk-adjustment is complex and, by its nature, difficult to understand. Although efforts have focused on improving the statistical reliability of quality metrics, this may represent but one half of the equation. Numeracy and interpretation of the data by decision makers are potentially equally important to effecting change. Because clinicians seem to have difficulty understanding risk-adjusted data, this deficit may be of growing importance as our risk-adjustment techniques become more sophisticated.

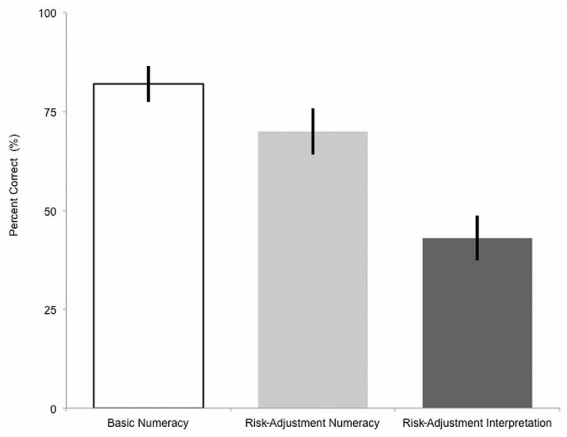

FIG. 2. Performance by conceptual category

We note that clinicians expressed concerns regarding the reliability of quality metric feedback. These findings corroborate recent research that has reported reservations from hospital leaders concerning quality data.[30,31] However, as shown in the context of patients and healthcare decisions, the aversion associated with quality metrics may be related to incomplete understanding of the data.[32] Whether perceptions of unreliability drive lack of understanding or, conversely, whether lack of understanding fuels perceived unreliability is an important question that requires further study.

This study has several strengths. First, we used rigorous survey development techniques to evaluate the understudied issue of quality metric numeracy. Second, our sample size was sufficient to show statistically significant differences in numeracy and comprehension of CLABSI quality metric data. Third, we leveraged social media to rapidly acquire this sample. Finally, our results provided new insights that may have important implications in the area of quality metrics.

There were also limitations to our study. First, the Twitter-derived sample precludes the calculation of a response rate and may not be representative of individuals engaged in CLABSI prevention. However, respondents were solicited from the Twitter-followers of 2 health services researchers (TJI, VC) who are actively engaged in scholarly activities pertaining to critically ill patients and hospital-acquired complications. Thus, our sample likely represents a highly motivated subset that engages in these topics on a regular basis—potentially making them *more* numerate than average clinicians. Second, we did not ask whether the respondents had previously seen CLABSI data specifically, so we cannot stratify by exposure to such data. Third, this study assessed only CLABSI quality metric data; generalizations regarding numeracy with other metrics should be made with caution. However, as many such data are presented in similar formats, we suspect our findings are applicable to similar audit-and-feedback initiatives.

The findings of this study serve as a stimulus for further inquiry. Research of this nature needs to be carried out in samples drawn from specific, policy-relevant populations (eg, infection control practitioners, bedside nurses, intensive care unit directors). Such studies should include longitudinal assessments of numeracy that attempt to mechanistically examine its impact on CLABSI prevention efforts and outcomes. The latter is an important issue as the link between numeracy and behavioral response, while plausible, cannot be assumed, particularly given the complexity of issues related to behavioral modification.[33] Additionally, whether alternate presentations of quality data affect numeracy, interpretation, and performance is worthy of further testing; indeed, this has been shown to be the case in other forms of communication.[34–37] Until data from larger samples are available, it may be prudent for quality improvement leaders to assess the comprehension of local clinicians regarding

feedback and whether lack of adequate comprehension is a barrier to deploying quality improvement interventions.

Quality measurement is a cornerstone of patient safety as it seeks to assess and improve the care delivered at the bedside. Rigorous metric development is important; however, ensuring that decision makers understand complex quality metrics may be equally fundamental. Given the cost of examining quality, elucidating the mechanisms of numeracy and interpretation as decision makers engage with quality metric data is necessary, along with whether improved comprehension leads to behavior change. Such inquiry may provide an evidence-base to shape alterations in quality metric deployment that will ensure maximal efficacy in driving practice change.

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Effect of a Handover Tool on Efficiency of Care and Mortality for Interhospital Transfers

Cecelia N. Theobald, MD, MPH[1,2*], Neesha N. Choma, MD, MPH[1], Jesse M. Ehrenfeld, MD, MPH[3], Stephan Russ, MD, MPH[4], Sunil Kripalani, MD, MSc[1,2]

[1]Department of Medicine, Vanderbilt University Medical Center, Nashville, Tennessee; [2]Center for Clinical Quality and Implementation Research, Vanderbilt University Medical Center, Nashville, Tennessee; [3]Departments of Anesthesiology, Surgery, Biomedical Informatics, and Health Policy, Vanderbilt University Medical Center, Nashville, Tennessee; [4]Department of Emergency Medicine, Vanderbilt University Medical Center, Nashville, Tennessee

BACKGROUND: Interhospital transfer is frequent, and transferred patients experience delays in the provision of care and higher mortality rates when compared to patients directly admitted. The interhospital handover is a key opportunity to improve care but has not been evaluated.

OBJECTIVE: To determine the effect of a universal handover tool on timeliness of care, length of stay (LOS), and mortality among interhospital transfer patients.

DESIGN, SETTING, AND PATIENTS: Retrospective cohort of patients transferred to an academic medical center between July 1, 2009 and December 31, 2010 with interrupted time-series design.

INTERVENTION: One-page handover tool containing information critical for immediate patient care instituted hospital-wide on July 1, 2010. The handover tool was completed by the transferring physician and available for review before patient arrival.

MEASUREMENTS: Time-to-admission order entry, LOS after transfer, in-hospital mortality

RESULTS: There was no significant change in the time-to-admission order entry after implementation (47 minutes vs. 45 minutes, adjusted $P = 0.94$). There was a nonstatistically significant reduction in LOS after implementation (6.5 days vs. 5.8 days, adjusted $P = 0.06$). In-hospital mortality for transfer patients declined significantly in the postintervention period from 12.0% to 8.9% (adjusted odds ratio, 0.68; 95% confidence interval, 0.47 – 0.99, $P = 0.04$). There was no change in mortality for the concurrent control group.

CONCLUSION: Implementation of a standardized handover tool for interhospital transfer was feasible and may be associated with significant reductions in length of stay and mortality. Widespread adoption of similar tools may improve outcomes in this high-risk population. *Journal of Hospital Medicine* 2017;12:23-28. © 2017 Society of Hospital Medicine

The transfer of inpatients between hospitals for specialized services is common, affecting nearly 10% of all Medicare admissions[1] and 4.5% of all critical care hospitalizations.[2] At tertiary referral centers, 49% of medical intensive care unit (ICU) admissions are transferred from another hospital.[3]

Transfer patients have longer length of stay (LOS) than patients admitted directly from the emergency department or clinic. Among patients initially admitted to an ICU, transfer patients spend 1 day to 2.2 more days in the ICU and an additional 2 days to 4 more days total at the receiving hospital.[4,5] Furthermore, transfer patients have higher mortality than nontransferred patients by 4% to 8%.[3-5] Even after adjustment for case mix and comorbid disease, interhospital transfer is an independent predictor of both ICU death and LOS.[6,7] As a result, interhospital transfer has been associated with a $9600 increase (on average) in hospital costs.[4]

Despite evidence detailing patient handovers as a key time when poor communication can lead to delays in care and significant patient risk,[8-10] most studies have focused on hospital discharge or change of shift, and scant effort has been dedicated to improving the interhospital handover. The process of interhospital transfer is often prolonged and discontinuous,[11] commonly including delays of more than 24 hours between initiation and completion. This frequently precludes direct physician-to-physician contact at the time of transfer, and physicians rely on the discharge/transfer summary.[12] Yet discharge summaries are frequently absent or incomplete,[13] and often lack information for high-risk treatments such as systemic anticoagulation.[14] The traditional reliance on discharge summaries for handover communication requires interpretation of unstandardized documentation and increases the risk for miscommunication, delays, and error.

To improve communication, we developed a 1-page handover tool for all inbound adult interhospital transfers to our academic medical center. We sought to determine whether implementation of this standardized handover tool improved the timeliness of initial care, LOS, and mortality among interhospital transfer patients.

METHODS

Study Design, Setting, Population

We conducted a retrospective cohort study of patients transferred into Vanderbilt University Hospital (VUH), an adult 626-bed quaternary care academic medical center in Nash-

***Address for correspondence and reprint requests:** Cecelia N. Theobald, Division of General Internal Medicine and Public Health, 1214 21st Ave. S, Medical Center East–NT, 7th floor Suite IV, Nashville, TN 37232; Telephone: 615-936-3216; Fax: 615-936-3156; E-mail: cecelia.theobald@vanderbilt.edu

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ville, Tennessee. The Vanderbilt University Institutional Review Board approved this study.

Population

We selected for inclusion all patients age 18 or older who were transferred into VUH between July 1, 2009 and December 31, 2010. We excluded patients whose transfer was routed outside the main VUH Patient Flow Center as well as patients who did not arrive alive at VUH. We also excluded patients transferred to the emergency department and patients admitted to obstetrics, burn, or trauma services, because these admitting services did not initially use the handover tool. Patients were followed for the duration of their hospitalization at VUH.

Intervention

The 1-page handover tool was developed with multidisciplinary physician input from house staff; medical directors from intensive care, neurology, and surgery; and the chief of staff. The tool was structured on the SBAR model (Situation, Background, Assessment, and Recommendation).[15] Fields on the handover tool were limited to those deemed critical for immediate patient care and designed for 1 tool to be used for both ICU and non-ICU transfers. Fields included primary diagnosis; allergies; use and last dose of anticoagulants, vasopressors, sedative/paralytics, and antibiotics; isolation needs; indwelling devices; recent operations/procedures; code status; emergency contact information; problem list; active medication list; vital signs; pertinent exam; imaging; lab findings; and overall reason for transfer.

The handover tool was completed by the physician at the transferring hospital, faxed to VUH, and immediately scanned into the electronic record, allowing the receiving physicians to review information before patient arrival. Use of the tool was piloted first with 2 referring hospitals in April 2010 and universally recommended but not compulsory for all adult patients routed through the main VUH Patient Flow Center beginning July 1, 2010. Immediately before full implementation, the chief of staff sent letters to leadership of the 40 highest volume referral hospitals, highlighting the institutional goal of improving hand-off communication, framing completion of the tool as a step in the transfer acceptance process, and providing contact information for questions, feedback, or concerns. To ensure the tool was a standard part of the transfer process, the VUH Patient Flow Center maintained the responsibility of faxing the form to the outside facility and monitoring its receipt. The tool was processed in the same manner as other faxed patient records and treated as a part of the formal medical record to meet all standards for the Health Insurance Portability and Accountability Act (HIPAA) and medicolegal compliance. The medical center also has a separate cardiac transfer center where the handover tool was not implemented owing to its specialized workflow.

Data Source

The VUH Patient Flow Center maintains a database of all patients for whom transfer to VUH is requested, including information on the requesting hospital and the duration of transfer process. Outcome data and patient characteristics were extracted from the Enterprise Data Warehouse. Data related to comorbid illness were extracted from the Perioperative Data Warehouse, an IRB-approved data registry.

Measures

We evaluated 3 outcomes. First, we defined 2 measures of the timeliness of initial care, the time from arrival at VUH until entry of an admission order, and the time from arrival until entry of the first antibiotic order. Only antibiotics ordered within the first 36 hours of admission were included. Second, we evaluated the total LOS after transfer to VUH and the ICU LOS for patients transferred into an ICU setting. Finally, we examined in-hospital mortality at VUH. These metrics were chosen for their broad applicability across patient groups and feasibility of data capture. Length of stay and mortality also represent final common pathways for avoidance of complications. Specific patient safety indicators and complications were not abstracted due to their low frequency and burden of data collection. Due to system changes in our cost accounting systems, we were not able to obtain cost data pre- and postimplementation that provided meaningful comparisons.

Patient covariates included age, gender, payer, and Elixhauser comorbidity index as modified by van Walraven,[16] calculated based on the admission of interest and the previous 365 days. We also examined admission characteristics including location (ICU vs. non-ICU), admitting service (medicine, surgery, neurology, or gynecology), and shift of arrival (day, 7:00 AM to 6:00 PM; or night, 6:00 PM to 7:00 PM). Finally, we examined duration of the transfer process (ie, time between transfer request and arrival at VUH) and the volume of the transferring hospital (high was defined as 3 or more transfers to VUH per year).

Statistical analysis

Patient characteristics before and after implementation of the handover tool were compared using Pearson's chi-square test and Fisher exact test for categorical variables and using Student t test and the Wilcoxon rank sum test for continuous variables. The outcome variables of time to admission order entry, time to antibiotic order entry, LOS, ICU LOS, and in-hospital mortality were compared between the before- and after-intervention time periods, using the Wilcoxon rank sum test for continuous outcomes and Pearson's chi-square test for in-hospital mortality.

To account for temporal trends, the effect of the handover tool on time-to-admission order entry, hospital LOS, and mortality was measured using an interrupted time-series design with segmented linear regression analysis.[17] The study period was divided into 2-week intervals, with 26 time periods in the pre-intervention period and 13 time periods in the postintervention period. Expected rates for the postintervention time periods were projected from the pre-intervention data using a linear regression model. To assess the observed effect

of the intervention, rates from the postintervention periods were compared with these projected rates, assuming continuation of the trend. Restricted cubic spline models were also fit for time-to-admission order and hospital LOS; however, the F-statistics for these models were not significant, suggesting the linear regression provided a more appropriate model.

To further account for potential confounding of outcomes by comorbid disease and other patient factors, multivariate linear regression models assessed change in timeliness and LOS with implementation of the intervention. A multivariate logistic regression model was used to assess change in mortality with intervention implementation. All models adjusted for age, gender, payer, comorbid illness, admitting team, shift of arrival (day vs. night), transfer duration, volume of transferring hospital, and ICU status. Outcomes were further adjusted for calendar month to account for temporal trends in house staff efficiency. Because the cardiac transfer center did not adopt the use of the transfer tool, we evaluated adjusted in-hospital mortality for these patients as a concurrent control group.

All statistical testing was 2-sided at a significance level of 0.05. All analyses were conducted using STATA 12.1 statistical software (StataCorp LP, College Station, Texas).

RESULTS

Of 10,325 patients for whom transfer to VUH was requested during the study period, 1715 met inclusion criteria, including 798 patients (46.5%) initially admitted to an ICU setting. Specific patient exclusions are detailed in the Supplemental Figure; the majority of exclusions were due to patients being transferred directly to the emergency department setting. Table 1 summarizes patient characteristics before and after implementation of the handover tool. The median age was 57 years, with 48.6% male patients. Accepting services included medicine (56%), surgery (34%), neurology (9%), and gynecology (1%). The median duration of transfer was 8 hours, and the majority (93%) of patients came from higher volume transferring hospitals. Most (65%) of patients were admitted during night shift. The median modified Elixhauser comorbidity index was 11 (range of possible scores, -19 to 89). A slightly higher proportion of patients admitted postimplementation of the handover tool came from higher volume transferring hospitals; otherwise, there were no significant differences between the pre- and postintervention groups.

Vanderbilt University Hospital received transfers from more than 350 unique facilities in more than 25 U.S. states during the overall study period. During the postintervention period, adherence to the handover process was excellent, with more than 85% of patients having a completed handover tool available in their medical record at the time of transfer. The remaining 15% had either incomplete forms or no form.

TABLE 1. Patient Characteristics Before and After Implementation of the Handover Sheet

Characteristic	Pre-intervention (n = 1105)	Postintervention (n = 610)	*P* value
Age, median (IQR)	56.9 (45 - 67)	57.4 (44 - 68)	0.85
Male	47.5%	50.7%	0.21
Payer			0.66
Commercial	37.7%	35.6%	
Medicaid	11.2%	10.5%	
Medicare	45.5%	48.7%	
Self-pay	5.6%	5.3%	
ICU admission (%)	46.4%	46.7%	0.91
Service			0.67
Medicine	55.4%	56.3%	
Surgery	33.9%	34.0%	
Neurology	8.9%	8.7%	
Gynecology	1.7%	1.0%	
Duration of transfer (hr), median (IQR)	8.1 (4.9, 19.3)	8.2 (5.2, 16.9)	0.69
Volume of transferring hospital			
≥ 3 transfers per year	92.4%	95.2%	0.027
< 3 transfers per year	7.6%	4.8%	
Time of arrival			
Day shift (7:00 AM – 6:00 PM)	35.7%	34.3%	0.56
Night shift (6: 00 PM – 7:00 PM)	64.3%	65.7%	
Modified Elixhauser index, median (IQR)[a]	11 (4-19)	11 (2-19)	0.85

[a]Range of possible scores: -19 to 89.

NOTE: Abbreviations: ICU, intensive care unit; IQR, interquartile range; LOS, length of stay.

TABLE 2. Effect of Handover Sheet Implementation on Timeliness of Care, LOS, and Mortality

Outcome	Pre-intervention (n = 1105)	Postintervention (n = 610)	Unadjusted *P* value	Adjusted *P* value
Time to admission order entry (min)	47 (20, 92)	45 (18, 87)	0.36	0.94
Time to antibiotic order[a] (min;n = 1117)	199 (78, 524)	202 (90, 492)	0.81	0.91
Hospital LOS (d)	6.47 (3.4, 11.7)	5.81 (3.1, 10.9)	0.18	0.06
ICU LOS (d; n = 793)	4.34 (2.2, 9.0)	4.55 (2.7, 8.8)	0.38	0.99
Inhospital mortality	12.0%	8.9%	0.04	0.04

[a]Limited to those patients who received antibiotic order within first 36 hours of admission. Values for LOS and time are presented as median (IQR). Multivariate model includes adjustment for age, gender, payer, admitting team, ICU status, time of admission, modified Elixhauser index, duration of transfer, and volume of transferring hospital; timeliness outcomes were further adjusted for calendar month.

NOTE: Abbreviations: ICU, intensive care unit. IQR, interquartile range; LOS, length of stay.

Timeliness of Initial Care

There was no change in either the median time-to-admission order entry after implementation (47 vs. 45 minutes, unadjusted *P* = 0.36) or time to antibiotic order entry (199 vs. 202 minutes; unadjusted *P* = 0.81; Table 2).

In the time-series analysis, the pre-intervention period did not have a significant temporal trend in median time-to-admission order entry (ß-coefficient = -0.27; 95% confidence interval [CI] -0.85 to 0.31; R2 = 0.04; *P* = 0.34; Figure 1A). The postintervention period showed a trend toward a reduction in median time-to-admission order entry (ß-coefficient = -1.39; 95% CI -2.92 to 0.15; R2 = 0.27; *P* = 0.07). There was no significant difference between the actual time-to-admission order entry in the postintervention period when compared to the projected rates from the pre-intervention period (*P* = 0.18).

After multivariate adjustment, the postintervention time period was not associated with any significant change in the median time-to-admission order entry (*P* = 0.94, R^2 = 0.09) nor time-to-antibiotic order entry (*P* = 0.91; R^2 = 0.08; Table 2).

Length of Stay

Hospital LOS demonstrated a nonstatistically significant decline after implementation of the handover tool from 6.47 days to 5.81 days (unadjusted *P* = 0.18; Table 2). There was no significant change in ICU LOS postintervention (4.34 days to 4.55 days; *P* = 0.38).

In time series analysis, hospital LOS did not have a significant temporal trend in either the pre-intervention period (ß-coefficient = 0.00094; 95% CI, -0.07 to 0.07; R2 = 0.00; *P* = 0.98) or the postintervention period (ß-coefficient = 0.09; 95% CI, -0.07 to 0.25; R2 = 0.13; *P* = 0.23; Figure 1B). Similarly, there was no significant difference between the actual and projected hospital LOS after implementation of the handover tool (*P* = 0.31).

After multivariate adjustment, the postintervention time period was associated with a trend toward reduction in overall LOS (*P* = 0.06; R^2 = 0.07) but no significant change in ICU LOS (*P* = 0.99; R^2 = 0.09).

Mortality

In-hospital mortality declined significantly from 12.0% in the pre-intervention period to 8.9% in the postintervention period (*P* = 0.04; Table 2). In time-series analysis, mortality did not have a significant trend in the pre-intervention period (ß-coefficient = 0.00017, 95% CI, -0.0020 to 0.0024; *P* = 0.878) and had a trend toward reduction in the postintervention period (ß-coefficient = -0.0032; 95% CI, -0.0091 to 0.0027; *P* = 0.255; Figure 1C) but did not reach statistical significance due to relatively small numbers of deaths in each individual time period.

After multivariate adjustment, the postintervention period was associated with overall lower odds of mortality among transfer patients when compared with the pre-intervention period (adjusted OR 0.68; 95% CI, 0.47 – 0.99; R^2 = 0.21; *P* = 0.04; Figure 2). Among the concurrent control group of patients routed through the cardiac transfer center, there was no significant change in mortality between the pre- and postintervention periods (adjusted OR 1.31; 95% CI, 0.88 – 1.93; R^2 = 0.28; *P* = 0.18).

DISCUSSION

We developed a simple 1-page handover tool for interhospital transfer patients and aimed to improve timeliness, efficiency, and outcomes of care at the receiving hospital. Implementation of the handover tool was feasible and well accepted by transferring physicians despite a geographically large and diverse transfer network. Although implementation did not substantially improve measures of the timeliness of initial care among transfer patients, we noted a nonsignificant trend toward reduced LOS postintervention.

We observed a substantial and statistically significant reduction in mortality among transfer patients after implementation of the handover tool that persisted after controlling for time trends, comorbid illness, and several other patient factors. This effect was not seen in a concurrent control group of cardiac transfer patients for whom the handover tool was not implemented. Standardizing communication regarding high-risk clinical care processes may be responsible for the observed mortality reduction, similar to improve-

ments seen in other small pilot studies.[18] We acknowledge that the magnitude of the improvement in mortality is more than might be expected from the handover tool alone and could be due to chance.

In this initial evaluation, it was not feasible to determine whether information provided in the handover tool helped avert specific complications that could affect mortality, such as complications related to the use of ventilators, high-risk medications, or indwelling devices. Assessment of additional patient safety indices such as code events, unplanned ICU transfers, and medication errors could also help clarify the effect of the handover tool on patient-safety outcomes, and future work should include these metrics as well. Alternately, the improvement in mortality may result from other unmeasured processes that occurred concurrently and verification of this finding should be completed in other settings.

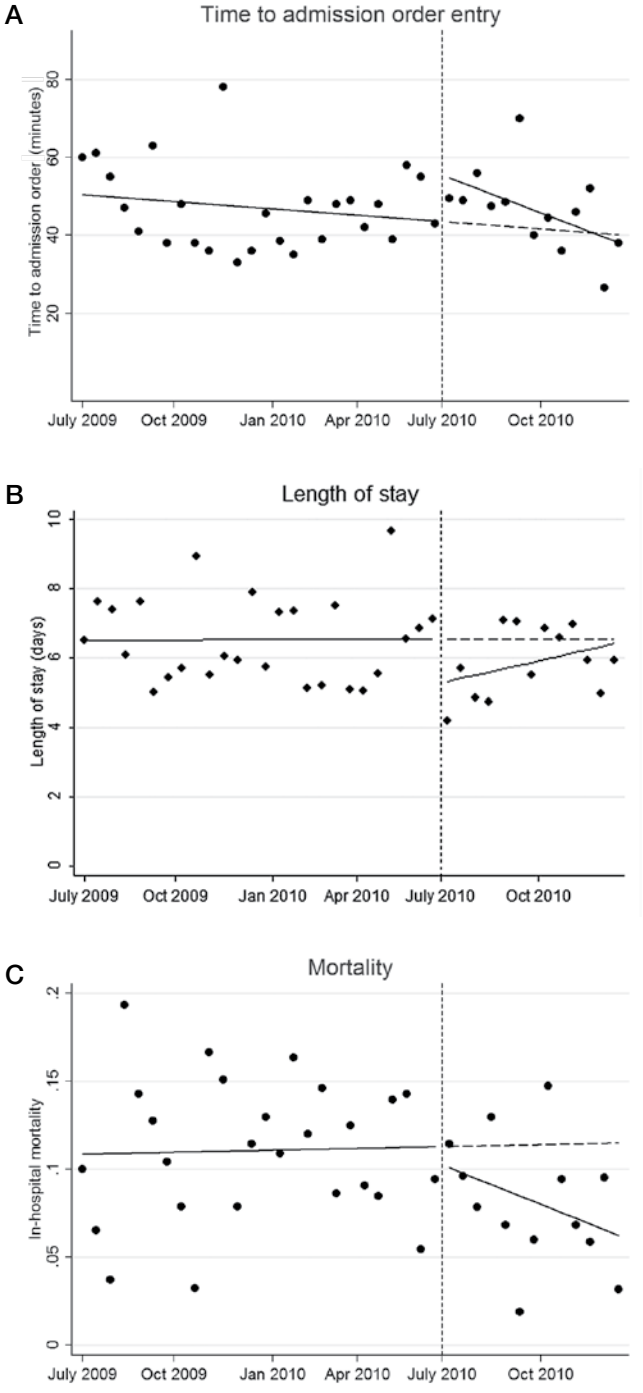

FIG. 1A-1C. Interrupted time series analysis of timeliness of order entry (A), length of stay (B), and mortality (C).

NOTE: Segmented regression analysis of median values during 2-week intervals from July 2009 to December 2010. The baseline period trend was projected into the intervention period to display expected values without implementation of the intervention. The vertical dashed line demarcates the pre- and postintervention periods.

CONCLUSION

More work is needed to determine suitable process and outcome measures for interhospital transfers. Most literature has focused on cost and LOS at the exclusion of more proximal measures of initial care.[3-7] The Institute of Medicine has identified timeliness as 1 of the 6 aims for care delivery redesign,[19] yet standardized timeliness outcomes do not exist across broad inpatient populations. We chose to monitor the time-to-admission order entry and time-to-antibiotic order entry as 2 indicators of timeliness that would be applicable to a variety of patients. The lack of change in these selected measures should prompt examination for other measures of efficiency, including those that affect nontransferred patients. It is possible that nontransferred patients cared for by the same physician also benefit from fewer delays or disruptions and experience increased efficiency of care if transfer patient communication is improved. Further work is necessary to understand whether other measures of timely initial patient care may be more suitable.

The use of a time-series design to account for temporal trends adds substantial rigor to this study, since the majority of these patients were cared for by house staff whose experience and efficiency vary throughout the academic year. Furthermore, subsequent multivariate analysis demonstrated consistent findings after adjustment for comorbid illness and

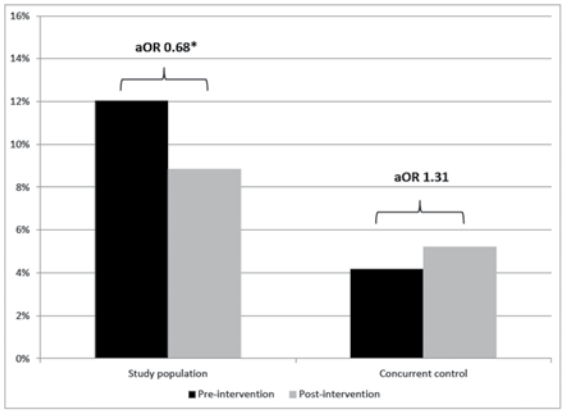

FIG. 2.: Inhospital mortality.

[a]Adjusted odd ratio for intervention group was significant at $P < 0.05$. Model includes adjustment for age, gender, payer, admitting team, ICU status, time of admission, and modified Elixhauser index.

NOTE: Inhospital mortality in study population pre- and postintervention compared to concurrent control group of transfer patients routed through cardiac transfer center during same time period who did not receive the intervention. Abbreviation: ICU, intensive care unit.

several other hospital and patient-level confounders.

This study has several limitations. The primary limitation is its nonrandomized design. Patient characteristics were stable across multiple variables before and after implementation, but it is possible that another confounding factor was responsible for observed improvements. Likewise, we collected data for only 6 rather than 12 months during the postintervention time period, which limited our sample size and statistical power. This was chosen because a significant restructuring of resident duty hours occurred in spring 2011 that had the potential to affect all measures studied.[20,21] Finally, we did not collect data on accuracy of the information provided in the handover tool or end-user utilization and were unable to account for effects of these.

Since implementation in 2010, this process for interhospital transfers at VUH remains the same, although the volume of incoming transfers has significantly increased. Electronic handover tools with similar structure and content have since been adopted for patients being transferred to the emergency department or directly admitted from clinic. As VUH moves in the coming years from a locally developed electronic medical record to a national vendor, there will be an opportunity to transform this tool into an electronic template that will easily share data between institutions and further enhance communication.

Interhospital transfer patients represent a high-risk population whose unique handover needs have not been adequately measured or addressed. Our investigation demonstrated that a standardized handover aid can be implemented across a broad transfer network and may contribute to reductions in LOS and mortality. Further study is warranted to confirm these findings and assess the effect on other clinical outcomes.

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Discharge Handoff Communication and Pediatric Readmissions

Ryan J. Coller, MD, MPH[1*], Thomas S. Klitzner, MD, PhD[2], Adrianna A. Saenz, MPH[2], Carlos F. Lerner, MD, MPhil[2], Lauren G. Alderette, MPH[3], Bergen B. Nelson, MD, MS[2,4], Paul J. Chung, MD, MS[2,4,5,6]

[1]Department of Pediatrics, University of Wisconsin, Madison School of Medicine and Public Health, Madison, Wisconsin; [2]Department of Pediatrics, David Geffen School of Medicine at UCLA, Los Angeles, California; [3]Department of Medicine, David Geffen School of Medicine at UCLA, Los Angeles, California; [4]Children's Discovery and Innovation Institute, Mattel Children's Hospital UCLA, Los Angeles, California; [5]Department of Health Policy and Management, UCLA Fielding School of Public Health, Los Angeles, California; [6]RAND Health, The RAND Corporation, Santa Monica, California

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 readmissions[1-5] 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 relationship[9-12] or, paradoxically, more utilization.[13,14] Brittan et al[15] 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.

***Address for correspondence and reprint requests:** Ryan J. Coller, Department of Pediatrics, University of Wisconsin, Madison, 600 Highland Ave, Madison, WI 53792; Telephone: 608-265-5545; Fax: 608-265-8074; E-mail: rcoller@pediatrics.wisc.edu

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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 developed 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-

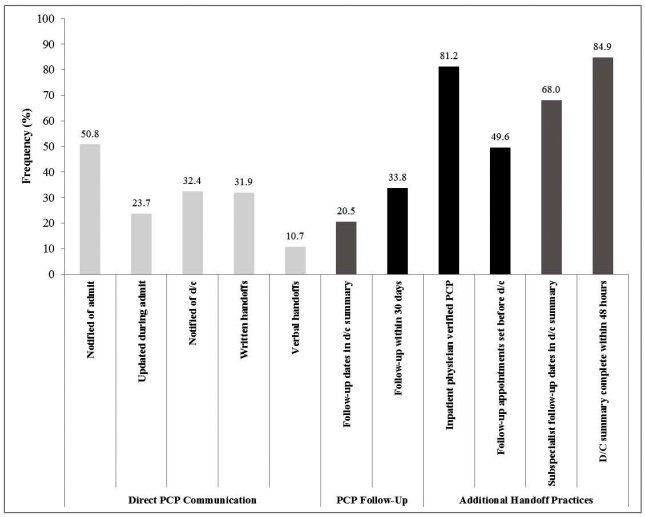

FIG. 1A. Handoff Communication Practices among Children at a Tertiary Children's Hospital[a]

[a]n=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.

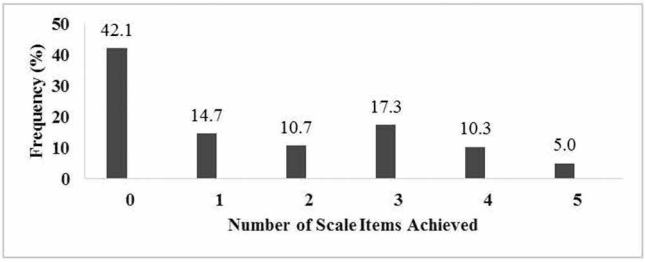

FIG. 1B. Hospital and Primary Care Provider Communication Scale

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	No Readmission n = 614	Unplanned Readmission n = 87	
	n (%)	n %	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 associated 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 n = 701	No Readmission n = 614	Unplanned Readmission n = 87	
	n (%)	%	%	*P*
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

[a]Hospital 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.

[b]Among patients with a PCP-reported follow-up visit.

[c]Adapted 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 evolved[2] 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 patients[32] 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)

[a]PCP 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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Characteristics and Outcomes of Fasting Orders Among Medical Inpatients

Atsushi Sorita, MD, MPH[1], Charat Thongprayoon, MD[2], John T. Ratelle, MD[1], Ruth E. Bates, MD[1], Katie M. Rieck, MD[1], Aditya P. Devalapalli, MD[1], Adil Ahmed, MD[3], Deanne T. Kashiwagi, MD[1]*

[1]Division of Hospital Internal Medicine, Mayo Clinic, Rochester, Minnesota; [2]Department of Internal Medicine, Bassett Medical Center, Cooperstown, New York; [3]Wichita Falls Family Practice Residency Program, North Central Texas Medical Foundation, Wichita Falls, Texas.

While many hospitalized patients have orders to fast in preparation for interventions, the extent to which these orders are necessary or adhere to evidence-based durations is unknown. In this study, we analyzed the length, indication, and associated outcomes of nil per os (NPO) orders for general medicine patients at an academic institution in the United States, and compared them to the best available evidence for recommended length of NPO. Of 924 NPO orders assessed, the indicated intervention was not performed for 183 (19.8%) orders, largely due to a change in plan (75/183, 41.0%) or scheduling barriers (43/183, 23.5%). When analyzed by indication, the median duration of NPO orders ranged from 8.3 hours for kidney ultrasound to 13.9 hours for upper endoscopy. For some indications, the literature suggested NPO orders may be unnecessary. Furthermore, in indications for which NPO was deemed necessary in the literature, the duration of most NPO orders was much longer than minimally required. These results suggest the need for establishing more robust practice guidelines or institutional protocols for NPO orders. *Journal of Hospital Medicine* 2017;12:36-39. © 2017 Society of Hospital Medicine

Frequent and prolonged fasting can lead to patient dissatisfaction and distress.[1] It may also cause malnutrition and negatively affect outcomes in high-risk populations such as the elderly.[2] Evidence suggests that patients are commonly kept fasting longer than necessary.[3,4] However, the extent to which nil per os (NPO) orders are necessary or adhere to evidence-based duration is unknown.

Our study showed half of patients admitted to the general medicine services experienced a period of fasting, and 1 in 4 NPO orders may be avoidable.[5] In this study, we aimed to provide action-oriented recommendations by 1) assessing why some interventions did not occur after NPO orders were placed and 2) analyzing NPO orders by indication and comparing them with the best available evidence.

METHODS

This retrospective study was conducted at an academic medical center in the United States. The study protocol was approved by the Mayo Clinic Institutional Review Board.

Detailed data handling and NPO order review processes have been described elsewhere.[5] Briefly, we identified 1200 NPO orders of 120 or more minutes' duration that were written for patients on the general medicine services at our institution in 2013. After blinded duplicate review, we excluded 70 orders written in the intensive care unit or on other services, 24 with unknown indications, 101 primarily indicated for clinical reasons, and 81 that had multiple indications. Consequently, 924 orders indicated for a single intervention (eg, imaging study, procedure, or operation) were included in the main analysis.

We assessed if the indicated intervention was performed. If performed, we recorded the time when the intervention was started. If not performed, we assessed reasons why it was not performed. We also performed exploratory analyses to investigate factors associated with performing the indicated intervention. The variables were 1) NPO starting at midnight, 2) NPO starting within 12 hours of admission, and 3) indication (eg, imaging study, procedure, or operation). We also conducted sensitivity analyses limited to 1 NPO order per patient (N = 673) to assess independence of the orders.

We then further categorized indications for the orders in detail and identified those with a sample size >10. This resulted in 779 orders that were included in the analysis by indication. We reviewed the literature by indication to determine suggested minimally required fasting durations to compare fasting duration in our patients to current evidence-based recommendations.

For descriptive statistics, we used median with interquartile range (IQR) for continuous variables and percentage for discrete variables; chi-square tests were used for comparison of discrete variables. All P values were two-tailed and $P < 0.05$ was considered significant.

RESULTS

Median length of 924 orders was 12.7 hours (IQR, 10.1-15.7 hours); 190 (20.1%), 577 (62.4%), and 157 (21.0%) orders were indicated for imaging studies, procedures, and operations, respectively. NPO started at midnight in 662 (71.6%) and within 12 hours of admission in 210 (22.7%) orders.

The indicated interventions were not performed in 183 (19.8%) orders, mostly as a result of a change in plan (75/183, 41.0%) or scheduling barriers (43/183, 23.5%). Plan chang-

***Address for Correspondence and Reprint Requests:** Deanne T. Kashiwagi, MD, Mayo Clinic, Division of Hospital Internal Medicine, 200 First Street SW, Rochester, MN 55905; Telephone: 507-255-8715; Fax: 507-255-9189; Email: kashiwagi.deanne@mayo.edu

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TABLE 1. Characteristics of NPO Orders Written for Interventions among Medical Inpatients

	All NPO orders	NPO started at midnight	NPO started within 12 hr of admission
N orders	924	662	210
N patients	673	458	204
Length, hours (median, IQR)	12.7 (10.1-15.7)	13.4 (11.4-15.9)	12.8 (10.1-16.3)
Indication (n, %)			
Total	924	662	210
Imaging study	190 (20.1%)	123 (18.6%)	40 (19.0%)
Procedure	577 (62.4%)	418 (63.1%)	146 (69.5%)
Operation	157 (17.0%)	121 (18.3%)	24 (11.4%)
Performed (n, %)			
Total	924	662	210
Yes	741 (80.2%)	546 (82.5%)	140 (66.7%)
No	183 (19.8%)	116 (17.5%)	70 (33.3%)
Why not performed (n, %)			
Total	183	116	70
Deemed unnecessary	105 (57.4%)	65 (56.0%)	42 (60%)
Plan changed	75	47	28
Clinically improved	29	18	14
Other	1	0	0
Needed but could not be performed	78 (42.6%)	51 (44.0%)	28 (40%)
Not available/fully booked	37	17	15
Elevated INR/high bleeding risk	13	11	8
Conflicts with other tasks/tests	6	5	3
Clinically unstable	5	5	0
Patient ate	1	1	0
Unknown	4	4	0
Other	12	8	2

NOTE: Abbreviations: hr, hours; INR, international normalized ratio, IQR, interquartile range, NPO, nil per os.

es occurred when, for example, input from a consulting service was obtained or the supervising physician decided not to pursue the intervention. Scheduling barriers included slots being unavailable and conflicts with other tasks/tests. Notably, only in 1 of 183 (0.5%) orders, the intervention was cancelled because the patient ate (Table 1).

NPO orders starting at midnight were associated with higher likelihood of indicated interventions being performed (546/662, 82.5% vs. 195/262, 74.4%; $P = 0.006$), as were NPO orders starting more than 12 hours after admission (601/714, 84.2% vs. 140/210, 66.7%; $P < 0.001$). Imaging studies were more likely to be performed than procedures or operations (170/190, 89.5% vs. 452/577, 78.3% vs. 119/157, 75.8%; $P = 0.001$). These results were unchanged when the analyses were limited to 1 order per patient.

When analyzed by indication, the median durations of NPO orders ranged from 8.3 hours in kidney ultrasound to 13.9 hours in upper endoscopy. These were slightly shortened, most by 1 to 2 hours, when the duration was calculated from start of the order to initiation of the intervention. The literature review identified, for most indications, that the minimally required length of NPO were 2 to 4 hours, generally 6 to 8 hours shorter than the median NPO length in this study sample. Furthermore, for indications such as computed tomography with intravenous contrast and abdominal ultrasound, the literature suggested NPO may be unnecessary (Table 2).[6-9,16-30]

DISCUSSION

We analyzed a comprehensive set of NPO orders written for interventions in medical inpatients at an academic medical center. NPO started at midnight in 71.6% of the analyzed orders. In 1 in 5 NPO orders, the indicated intervention was not performed largely due to a change in plan or scheduling barriers. In most NPO orders in which the indicated interventions were performed, patients were kept fasting either unnecessarily or much longer than needed. This study is the first of its kind in evaluating NPO-ordering practices across multiple indications and comparing them with the best available evidence.

These results suggest current NPO practice in the hospital is suboptimal, and limited literature measures the magnitude of this issue.[6,7] An important aspect of our study findings is that, in a substantial number of NPO orders, the indicated interventions were not performed for seemingly avoidable reasons. These issues may be attributable to clinicians' preemptive decisions or lack of knowledge, or inefficiency in the healthcare system. Minimizing anticipatory NPO may carry drawbacks such as delays in interventions, and limited evidence links excessive NPO with clinical outcomes (eg, length of stay, readmission, or death). However, from the patients' perspective, it is important to be kept fasting only for clinical benefit. Hence, this calls for substantial improvement of NPO practices.

Furthermore, results indicated that the duration of most

TABLE 2. Characteristics of NPO Orders by Indication and Required Minimal Length of NPO by Literature

		All NPO orders		NPO orders in which the indicated intervention was performed		
Indication		N	Median length (IQR, hr)	N	Median length (IQR, hr)[a]	Minimally needed NPO length[b]
Total		779	12.8 (10.2-15.9)	624	10.9 (8.7-13.6)	
Imaging study	Transesophageal echocardiography	38	12.7 (11.1-14.4)	34	9.8 (8.7-11.6)	3 hr[16,17]
	Abdominal ultrasound	29	8.8 (5.4-12.1)	29	7.0 (3.1-11.1)	Need for fasting unclear[18,19]
	Kidney ultrasound	27	8.3 (5.2-13.1)	24	8.1 (3.7-10.0)	No fasting[20 c]
	CT with IV contrast	22	11.1 (9.4-15.0)	16	10.8 (8.1-13.7)	No fasting[6,11]
	PET/CT	15	12.0 (7.6-16.1)	15	11.2 (7-14.7)	4 hr[21]
Procedure	Upper endoscopy	119	13.9 (11.4-16.7)	92	10.4 (8.2-13.0)	2 hr[9,10,22]
	CT-guided line placement (not involving GI tract)	82	13.5 (10.0-16.2)	66	12.5 (9.6-14.8)	No fasting[7] or 2 hr[8,23]
	CT/US-guided aspiration/biopsy	73	12.9 (10.6-15.2)	54	11.6 (10.4-14.8)	No fasting[7] or 2 hr[8,23]
	Colonoscopy	63	13.4 (10.9-17.5)	50	11.4 (9.6-14.9)	2 hr[24,25]
	Bronchoscopy	41	12.1 (10.3-15.4)	23	11.1 (9.9-15.0)	2 hr[8,26]
	Conscious sedation[d]	34	13.3 (10.9-16.2)	33	11.6 (9.9-13.0)	No fasting[7] or 2 hr[8,23]
	Angiogram/ venogram	26	13.8 (8.4-15.9)	22	11.7 (7.1-12.8)	No fasting[7] or 2 hr[8,23]
	US-guided thoracentesis	19	10.3 (7.2-12.9)	18	9.3 (6.8-10.9)	No fasting[27]
	US-guided paracentesis	18	11.3 (10.4-14.4)	16	11.0 (8.0-13)	No fasting[28]
	ERCP	16	12.9 (11.4-17.5)	12	9.1 (7.8-13.1)	No study[e]
Operation		157	13.6 (10.6-17.4)	119	11.6 (8.7-14.1)	2 hr[8]

[a] Duration calculated from the starting time of the NPO order to that of the intervention.

[b] Minimally required NPO length was obtained from the best available evidence found in the literature search. Note that these lengths apply only to clear liquids in general.

[c] Fasting for 8-12 hours may be required for arterial examination by Doppler ultrasound.[29,30]

[d] Included are MRI, bone marrow biopsy, and wound VAC exchange that were ordered with conscious sedation by anesthesia support.

[e] Generally, patients are made NPO for more than 6 to 8 hr.

NOTE: Abbreviations: CT, computed tomography; ERCP, endoscopic retrograde cholangiopancreatography; GI, gastrointestinal; hr, hours; IQR, interquartile range; IV, intravenous; MRI, magnetic resonance imaging; NPO, nil per os; PET, positron emission tomography; US, ultrasound; VAC, vacuum-assisted closure.

NPO orders was longer than the minimal duration currently suggested in the literature. Whereas strong evidence suggests that no longer than 2 hours of fasting is generally required for preoperative purposes,[8] limited studies have evaluated the required length of NPO orders in imaging studies and procedures,[9-11] which comprised most of the orders in the study cohort. For example, in upper endoscopy, 2 small studies suggested fasting for 1 or 2 hours may provide as good visualization as with the conventional 6 to 8 hours of fasting.[9,10] In coronary angiography, a retrospective study demonstrated fasting may be unnecessary.[11] Due to lack of robust evidence, guidelines for these interventions either do not specify the required length of fasting or have not changed the conventional recommendations for fasting, leading to large variations in fasting policies by institution.[6,12] Therefore, more studies are needed to define required length of fasting for those indications and to measure the exact magnitude of excessive fasting in the hospital.

One of the limitations of this study is generalizability because NPO practice may considerably vary by institution as suggested in the literature.[4,6,12] Conversely, studies have suggested that excessive fasting exists in other institutions.[3,4,13] Thus, this study adds further evidence of the prevalence of suboptimal NPO practice to the literature and provides a benchmark that other institutions can refer to when evaluating their own NPO practice. Another limitation is the assumption that the evidence for minimally required NPO duration can be applied to our patient samples. Specifically, the American Society of Anesthesiologists guideline states that preoperative or preprocedural fasting may need to be longer than 2 hours for 1) patients with comorbidities that can affect gastric emptying or fluid volume such as obesi-

ty, diabetes, emergency care, and enteral tube feeding, and 2) patients in whom airway management might be difficult.[8] We did not consider these possibilities, and as these conditions are prevalent in medical inpatients, we may be overstating the excessiveness of fasting orders. On the other hand, especially in patients with diabetes, prolonged fasting may cause harm by inducing hypoglycemia.[14] Further, no study rigorously evaluated safety of shortening the fasting period for these subsets of patients. Therefore, it is necessary to establish optimal duration of NPO and to improve NPO ordering practice even in these patient subsets.

While more research is needed to define optimal duration of NPO for various interventions and specific subsets of patients and to establish linkage of excessive NPO with clinical outcomes, our data provide insights into immediate actions that can be taken by clinicians to improve NPO practices using our data as a benchmark. First, institutions can establish more robust practice guidelines or institutional protocols for NPO orders. Successful interventions have been reported,[15] and breaking the habit of ordering NPO after midnight is certainly possible. We recommend each institution does so by indication, potentially through interdepartmental work groups involving appropriate departments such as radiology, surgery, and medicine. Second, institutional guidelines or protocols can be incorporated in the ordering system to enable appropriate NPO ordering. For example, at our institution, we are modifying the order screens for ultrasound-guided paracentesis and thoracentesis to indicate that NPO is not necessary for these procedures unless sedation is anticipated. We conclude that, at any institution, efforts in improving the NPO practice are urgently warranted to minimize unnecessary fasting.

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Physicians Are Often Incorrect About the Telemetry Status of Their Patients

Sajan Patel, MD[1]*, Sayumi De Silva, MD[2], Erin Dowling, MD[3]

[1]Division of Hospital Medicine, University of California, San Francisco Medical Center, San Francisco, California; [2]Internal Medicine and Pediatrics, Chinle Comprehensive Health Care Center, Chinle, Arizona; [3]Department of Internal Medicine, University of California, Los Angeles Medical Center, Los Angeles, California.

Cardiac telemetry is overused in hospitals and continues to be a source of healthcare waste.[1-4] Its overuse is considered a leading issue in quality initiatives, as highlighted by its presence in the top 5 recommendations by the Society of Hospital Medicine to the Choosing Wisely Campaign.[5] There have been multiple published studies on efforts to curb telemetry overuse, including educational campaigns, hard-wiring guidelines into the electronic health record (EHR), and discontinuation protocols.[6-9]

Less studied, however, are the causes of telemetry overuse. While lack of knowledge of guidelines may contribute to inappropriate initial ordering of telemetry,[1,4] physicians may forget to discontinue it when the original indication is no longer present, ie, a form of "clinical inertia." The authors aimed to study how often inpatient clinicians were aware (or unaware) of the telemetry status of their patients.

METHODS

The authors conducted a cross-sectional observational study at 2 academic medical centers within the same healthcare system (University of California, Los Angeles [UCLA] Health System) over a 10-week period, from December 12, 2014 to February 18, 2015. The survey included senior resident physicians (in years 2 or 3 of training), attending physicians on teaching services ("teaching attendings"), and attending physicians on nonteaching services ("direct-care attendings") caring for hospitalized patients on general internal medicine (nonintensive care) units. First-year residents ("interns") were not surveyed because their presence at interdisciplinary rounds, where surveying took place, was not mandatory. At both hospitals, telemetry is initiated by placing a "Continuous Cardiac Monitoring" order in the EHR, and is terminated by selecting "Discontinue" on that same order. Telemetry status of patients was determined through a daily review of the EHR at UCLA Ronald Reagan Hospital, where presence of telemetry was defined as an active order for telemetry as of 7 AM. At UCLA Santa Monica Hospital, telemetry status was determined by daily review of the morning telemetry technician logs, which reflected telemetry status as of 7 AM.

***Address for correspondence and reprint requests:** Sajan Patel, University of California, San Francisco, Division of Hospital Medicine, 533 Parnassus Avenue, Box 0131, San Francisco, CA 94143-0131; Telephone: 415-502-5137; Fax: 415-476-4818; Email: sajan.patel@ucsf.edu

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Once-weekly, prior to afternoon interdisciplinary rounds, members of the study team would give physicians a print-out of their patient list and ask them to mark whether or not their patients were on telemetry as of that morning. They were allowed to reference their own printed patient list, but were not allowed to reference the EHR. Since interdisciplinary rounds occurred in the afternoon, it was assumed that all clinicians had seen and examined their patients. The authors did not mandate that physicians respond to the survey, and we did not collect information on individual physician characteristics other than training status.

The primary outcome of interest was correct assessment of telemetry status. The authors first presented descriptive statistics for patient, provider, and telemetry status, and used $\chi 2$ tests and McNemar's test to compare the type of physician (resident, teaching attending, or direct-care attending) with the binary outcome (correct or incorrect assessment). STATA/SE, 13.1 (StataCorp), was used for all statistical analysis, and P values < 0.05 were considered statistically significant. The study was submitted to the UCLA Office of Human Research Protection Program and exempted from Institutional Review Board review.

RESULTS

A total of 1,379 physician-assessments on 962 patients were obtained during the study period. During this time, 53.1% (511/962) of patients were on telemetry. Overall, physicians were incorrect in 26.5% (365/1379) of their assessments of telemetry status (Table). Of the 745 assessments of a patient on telemetry, clinicians erroneously reported that they were not 27.9% of the time (n = 208). Of the 634 assessments of a patient not on telemetry, clinicians erroneously reported that patients were on it 24.8% of the time (n = 157).

Assessments by direct-care attendings were more accurate than those done by teaching attendings (80.9% vs. 72.4%, $P < 0.05$) and resident physicians (80.9% vs. 71.8%, $P < 0.05$). There was no statistically significant difference in accuracy of resident physician assessments when compared to teaching attending assessments (71.8% vs. 72.4%, $P = 0.81$).

DISCUSSION

In this study, clinicians often inaccurately recalled the telemetry status of their hospitalized patients. These findings have implications for both patient safety as well as telemetry overuse, as ignorance of telemetry status may limit its discontinuation.

The authors also found that assessments done by di-

TABLE. Assessment of Telemetry Status by Provider

	Assessments/Total (n/N, %)			
Provider	Erroneously Marked That Patient Was Not on Telemetry	Erroneously Marked That Patient Was on Telemetry	Incorrect Assessment of Telemetry Status	Correct Assessment of Telemetry Status
Resident physician[a]	85/301 (28.2%)	70/248 (28.2%)	155/549 (28.2%)	394/549 (71.8%)
Teaching attending[b]	98/332 (29.5%)	69/273 (25.2%)	167/605 (27.6%)	438/605 (72.4%)
Direct-care attending[c] (nonteaching service)	25/112 (22.3%)	18/113 (15.9%)	43/225 (19.1%)	182/225 (80.9%)
Total	208/745 (27.9%)	157/634 (24.8%)	365/1,379 (26.5%)	1014/1,379 (73.5%)

[a] Second- or third-year internal medicine resident who takes care of hospitalized patients under the supervision of a teaching attending

[b] Physician who supervises resident physicians in caring for hospitalized patients

[c] Physician who cares for hospitalized patients without resident physicians

rect-care attendings were more accurate than those done by teaching attendings. This discrepancy is likely related to different roles in patient care: teaching attendings provide supervisory roles, while direct-care attendings routinely review orders and perform detailed exams on their patients. Similarly, resident physician assessments were found to be less accurate than direct-care attending assessments, which may reflect less clinical experience as well as their supervisory role.

In light of these findings, interventions to reduce telemetry overuse should include efforts to increase real-time telemetry awareness as well as reduce inappropriate use, and should target all levels of training. Using research on urinary catheter removal[10] as a model, strategies to increase telemetry awareness could include daily verbal or written reminders of telemetry status, requests to assess daily need, high visibility signs in charts or in patient rooms, or electronic reminders that telemetry is in place. Furthermore, efforts to promote and operationalize medical mindfulness, in which providers are trained to be aware of indications, timely removal, and the presence of monitoring devices could be incorporated into broader telemetry stewardship and high-value care efforts.[11]

There are limitations to this study. The authors did not collect information on the number of unique individual physicians represented by the study, and, thus, clinicians may have been surveyed multiple times throughout the study, potentially influencing their attention to the telemetry status of their patients. In addition, this study was conducted within a single healthcare system, limiting its generalizability.

In conclusion, the authors found that physicians were often incorrect when assessing the telemetry status of their patients. Interventions to help raise awareness of a patient's telemetry status may help reduce telemetry overuse.

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Routine Replacement of Peripheral Intravenous Catheters

Sanjay A. Patel, MD[1]*, Michael M. Alebich, DO[1], Leonard S. Feldman, MD[2]

[1]*Division of Hospital Medicine, Department of Medicine, John H. Stroger, Jr. Hospital of Cook County, Chicago, Illinois;* [2]*Departments of Medicine and Pediatrics, Johns Hopkins University School of Medicine, Baltimore, Maryland.*

The "Things We Do for No Reason" (TWDFNR) series reviews practices which have become common parts of hospital care but which may provide little value to our patients. Practices reviewed in the TWDFNR series do not represent "black and white" conclusions or clinical practice standards, but are meant as a starting place for research and active discussions among hospitalists and patients. We invite you to be part of that discussion.

Hospitals and health systems worldwide have adopted policies for routine replacement of peripheral intravenous catheters (PIVCs) at prespecified time intervals (range, 48-96 hours). This practice accounts for a large number of PIVC reinsertions and places a significant cost burden on the healthcare infrastructure. The authors of this article examine the evidence that has been used to support this practice.

CASE PRESENTATION

A 67-year-old man with metastatic lung cancer presents to a hospital for pain control and "failure to thrive." In the emergency department, a left antecubital peripheral intravenous catheter (PIVC) is placed. On admission, a prerenal acute kidney injury is noted. During the patient's entire hospitalization, normal saline with parenteral hydromorphone is administered. On hospital day 4, the pain is still not adequately controlled, and the intravenous opioid is continued. On morning rounds, an intern notes that the PIVC is functioning well, and there are no signs of irritation. However, the nursing staff reminds the team that the PIVC should be changed because it has been in place for 4 days and is "due for replacement." The patient does not want to receive another skin puncture for routine venous access. Does the PIVC need to be replaced, per routine?

WHY YOU MIGHT THINK ROUTINE PIVC REPLACEMENT IS HELPFUL

PIVC placement is easily the most common procedure performed in the United States. An estimated 200 million PIVCs are placed each year.[1] Given the number of inpatient hospital stays per year in the United States alone—more than 37 million[1,2]—data regarding the care, maintenance, and complications of PIVCs are essential to the healthcare infrastructure.

The recommendation to routinely replace PIVCs dates to 1981, when the Centers for Disease Control and Prevention[3] (CDC) issued a guideline that calls for replacing PIVCs every 24 to 48 hours. Most of the data and studies that established that recommendation originated in the 1970s, when catheters varied in length and material, and precise definitions of complications, such as phlebitis—localized vein inflammation characterized by pain, erythema, tenderness, swelling, and a palpable cord[4,5]—were not standardized across trials. Research at the time suggested higher rates of complications from IVCs dwelling longer than 48 to 72 hours. The latest (2011) CDC guidelines[6,7] softened the recommendation but still concluded, "There is no need to replace peripheral catheters more frequently than every 72-96 hours."

The 2011 recommendation[6,7] is based on findings of a 1983 prospective observational study,[8] a 1991 randomized controlled trial (RCT),[9] and a 1998 prospective observational study.[2] The 1983 and 1991 studies found higher rates of PIVC complications after day 2 of cannulation.[8,9] The 1998 study found no increase in the rate of complications after day 3 of catheterization, and its authors, recommending a reevaluation of the need to routinely replace PIVCs, wrote, "[The] hazard for catheter-related complications, phlebitis, catheter-related infections, and mechanical complications did not increase during prolonged catheterization."[2]

Results of RCTs conducted by Barker et al.[10] (2004) and Nishanth et al.[11] (2009) supported the claim that routine replacement of PIVCs leads to lower rates of thrombophlebitis. Nishanth et al. also included site pain and cannula dislodgement in their definition of phlebitis. Neither study compared blood stream infection rates, but both found higher rates of phlebitis between day 2.5 and day 3. However, *Cochrane* reviewers Webster et al.[12] questioned the findings of these 2 trials, given their missing data and possibly biased results and conclusions. In the Barker study, patient numbers (screened, eligible, dropout) were unclear; each patient group was unbalanced; protocol deviations were not reported (possibly a result of incomplete data reporting or inappropriate randomization); and varied definitions of phlebitis were allowed, which may have resulted in more events being included. In the Nishanth study, the 100% phlebitis rate for the clinically indicated replacement group seemed extreme, which suggested confounding by an unknown bias or chance. Last, both samples were small: 47 patients (Barker) and 42 patients (Nishanth). Given all these concerns,

***Address for correspondence and reprint requests:** Sanjay A. Patel, MD, Division of Hospital Medicine, Department of Medicine, John H. Stroger, Jr. Hospital of Cook County, Room 570A, Administration Building, 1901 W Harrison St, Chicago, IL 60612; Telephone: 312-864-4522; Fax: 312-864-9958; E-mail: spatel30@cookcountyhhs.org

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TABLE. Sample Peripheral Intravenous Catheter Inspection Protocol for Local Complications[a]

Phlebitis defined as ≥2 of the following:
Pain or tenderness reported by patient on questioning and on subsequent palpation by nursing staff (severity ≥2 on 10-point scale)
Erythema extending at least 1 cm from insertion site
Swelling extending at least 1 cm from insertion site
Purulent discharge
Palpable venous cord beyond peripheral intravenous catheter tip

[a]Measures repeated daily and 48 hours after removal (by telephone if already discharged).

the 2 trials were excluded from the *Cochrane* meta-analysis on the subject.[12]

In the 1980s and early 1990s, routine removal and exchange of PIVCs were supported by limited evidence. Current well-designed trial data cast doubt on the need for such a practice.

WHY YOU SHOULD NOT ROUTINELY REPLACE PIVCS

According to the CDC,[6,7] the issue of routine PIVC replacement remains unresolved: "No recommendation is made regarding replacement of peripheral catheters in adults only when clinically indicated."

Whereas earlier data showed a higher risk of complications with longer dwelling IVs, the majority of contemporary data has failed to support this conclusion. The recent (2015) *Cochrane* meta-analysis comparing routine with clinically indicated IVC replacement found "no evidence to support changing catheters every 72-96 hours."[12] Of the 7 studies that fulfilled the criteria for qualitative analysis, only 5 were included (the studies by Barker et al.[10] and Nishanth et al.[11] were excluded). The included studies assessed the endpoints of catheter-related blood stream infection (CRBSI), phlebitis, phlebitis per device-days, mortality, cost, and infiltration. Statistically significant differences were found only for cost (favoring clinically indicated replacement) and infiltration (occurring less with routine replacement).

The largest and most robust RCT in the meta-analysis[12] was conducted by Rickard et al.[13] (2012). Their nonblinded, intention-to-treat study of 3283 patients used concealed allocation to randomly assign patients to either clinically indicated or routine PIVC replacement in order to evaluate a primary endpoint, phlebitis. Secondary endpoints were CRBSI, venous port infection, IVC tip colonization, infusion failure, number of IVCs needed per patient, IV therapy duration, cost, and mortality. Need for PIVC replacement was methodically monitored (Table) with extensive nursing education and interrater validation. The study found no difference in the groups' phlebitis rates; the rate was 7% for both routine and clinically indicated replacement (13.08% and 13.11%, respectively, adjusted for phlebitis per 1000 IVC days). In addition, there was no difference in the secondary outcome measures, except cost and number of catheters used, both of which favored clinically indicated replacement. The most serious complication, CRBSI, occurred at essentially the same rate in the 2 replacement arms: 0.11% (routine) and 0% (clinically indicated). Per-patient cost for the entire course of treatment was A$69.24 in the routine group and A$61.66 in the clinically indicated group; the difference was A$7.58 ($P < 0.0001$). Mean number of catheters used was 1.9 in the routine group and 1.7 in the clinically indicated group; the difference was 0.21 catheter per patient for the treatment course ($P < 0.0001$). Overall, the study found no important difference in significant outcomes between the 2 study arms.

The other 4 studies in the meta-analysis[12] duplicated these results, with none finding a higher rate of major adverse events.[14-17] All 4 showed virtually equivalent rates of phlebitis, the primary outcome; 3 also examined the secondary outcome measure of blood stream infection, and results were similar, with identical rates of complications. Only 1 trial identified any bloodstream infections (1 per group).[15] The meta-analysis did find that routine catheter replacement resulted in less catheter infiltration.

Most of the data on PIVC exchange involves phlebitis and other local complications. A prospective study by Stuart et al.[18] and commentary by Collignon et al.[19] underscore the need for further research targeting blood stream infections (sepsis and severe sepsis in particular) as a primary outcome. Blood stream infections, especially those related to PIVC use, are rare entities overall, with most recent data yielding an estimated rate of 0.5 per 1000 catheter-days.[20] Given this epidemiologic finding, researchers trying to acquire meaningful data on PIVC-related blood stream infections and subsequent complications would need to have tens of thousands of patients in routine and clinically indicated replacement arms to sufficiently power their studies.[20] As they are infeasible, such trials cannot be found in the scientific literature.

Stuart et al.[18] tried addressing the question. Prospectively examining more than 5 million occupied-bed days and the incidence of bloodstream infections by type of intravascular device over a 5-year period, they found that 137 (23.5%) of 583 healthcare-associated *Staphylococcus aureus* bacteremia (SAB) cases were attributed to PIVC use. PIVC insertions were performed equally (39.6%) in emergency departments and medical wards. About 45% of PIVCs remained in place 4 days or longer. Stuart et al. noted the "significant issue of PIVC-associated SAB" and favored routine removal of PIVCs within 96 hours (4 days). However, 55% of patients in their PIVC-related SAB group had the device in place less than 4 days. In addition, overall incidence of SAB was low: 0.3 per 10,000 occupied-bed days. Further, their study did not adjust device-specific SAB incidence for frequency of device use. For example, the rate of healthcare-acquired SAB was 19.7% for central venous catheters and 23.5% for PIVCs, despite PIVCs being used significantly more often than central lines. Device-specific adjustments would show a vastly different absolute risk of SAB in relation to individual devices. Nevertheless, the overall benefit of and need

for routine PIVC replacement must be questioned. The percentage of PIVC-associated SAB in their study and the need for more research in this area should be noted. Given current information, their study and others in the literature underscore the need for selective use, appropriate maintenance, and timely removal of PIVCs.

Pure clinical outcomes are important, but procedural costs are as well. Clinically indicated replacement helps patients avoid an unpleasant procedure and saves money.[21] If one third of the 37 million annual inpatient admissions require a PIVC for more than 3 days, then a strategy of "replacement when clinically indicated" could prevent almost 2.5 million unnecessary PIVC insertions each year. Equipment cost savings combined with savings of nearly 1 million staff hours could yield an estimated $400 million in savings over a 5-year period.[22] Given current data suggesting no harm from clinically indicated PIVC replacement and clear evidence that routine replacement increases needle sticks and costs, it seems time to end the practice of routine PIVC replacement.

RECOMMENDATIONS

Compared with clinically indicated catheter replacement, routine replacement in the absence of a clinical indication (eg, infiltration, phlebitis, infection) provides no added benefit. Studies have consistently found that rates of phlebitis and SAB are not affected by scheduled replacement, though the largest RCT may not have been powered to show a difference in SAB. The present authors' recommendations for PIVC care are:

- Scrutinize each patient's need for PIVCs and remove each PIVC as soon as possible.
- Do not make routine replacement of otherwise well-functioning, well-appearing clinically necessary PIVCs the standard of care.
- Regularly examine PIVC sites for signs and symptoms of infection.
- Remove a PIVC immediately on recognition of any clinical sign of a complication (eg, infiltration, phlebitis, localized infection, blood stream infection) and replace the PIVC only if there is a clinical need.
- If replacing PIVCs on a clinical basis, establish protocols for frequency of evaluation for complications; these protocols might mirror those from prior studies (Table).[10,22]
- Replace as soon as possible any PIVC inserted during an urgent or emergent situation in which proper insertion technique could not be guaranteed.
- Conduct real-world observational studies to ensure that the switch to clinically driven replacement is safe and develop standardized definitions of complications.

Given the literature findings and the preceding recommendations, the authors conclude that the patient in the case example does not need routine PIVC replacement. His PIVC may remain in place as long as evaluation for local complications is routinely and methodically performed and the device is removed as soon as it is deemed unnecessary (transition to oral opioid therapy).

CONCLUSION

The long-standing practice of routinely replacing PIVCs every 72 to 96 hours during a hospital stay does not affect any meaningful clinical outcome. Specifically, data do not show that routine replacement prevents phlebitis or blood stream infections. Furthermore, routine PIVC replacement increases patient discomfort, uses resources unnecessarily, and raises hospital costs. Most of the PIVC research has involved phlebitis and other local complications; more research on PIVC use and bloodstream infections is needed. Given the findings in the current literature, routine PIVC replacement should be considered a Thing We Do For No Reason.

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Do you think this is a low-value practice? Is this truly a "Thing We Do for No Reason"? Share what you do in your practice and join in the conversation online by retweeting it on Twitter (#TWDFNR) and liking it on Facebook. We invite you to propose ideas for other "Things We Do for No Reason" topics by emailing TWDFNR@hospitalmedicine.org.

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Post–Acute Care Reform: Implications and Opportunities for Hospitalists

Robert E. Burke, MD, MS[1,2,3]*, Ethan Cumbler, MD[3], Eric A. Coleman, MD, MPH[4], Cari Levy, MD, PhD[1,4]

[1]Research Section and [2]Hospital Medicine Section, Denver VA Medical Center, Denver, Colorado; [3]Division of General Internal Medicine and [4]Division of Health Care Policy and Research, University of Colorado School of Medicine, Aurora, Colorado.

Nearly all practicing hospitalists have firsthand experience discharging patients to post–acute care (PAC), which is provided by inpatient rehabilitation facilities, skilled nursing facilities, or home healthcare providers. Many may not know that PAC is poised to undergo transformative change, spurred by recent legislation resulting in a range of reforms. These reforms have the potential to fundamentally reshape the relationship between hospitals and PAC providers. They have important implications for hospitalists and will open up opportunities for hospitalists to improve healthcare value. In this article, the authors explore the reasons for PAC reform and the scope of the reforms. Then they describe the implications for hospitalists and hospitalists' opportunities to Choose Wisely and improve healthcare value for the rapidly growing number of vulnerable older adults transitioning to PAC after hospital discharge. *Journal of Hospital Medicine* 2017;12:46-51. © 2017 Society of Hospital Medicine

The landscape of post–acute care (PAC), which is predominantly provided by inpatient rehabilitation facilities (IRFs), skilled nursing facilities (SNFs), and home healthcare (HHC) providers, is rapidly changing. As hospitalizations shorten, PAC utilization is rising, resulting in rapidly increasing costs.[1-5] However, patient outcomes in PAC are characterized by high rates of readmission and low rates of return to the community.[6,7] Emerging evidence suggests these outcomes could be substantially improved through use of better in-hospital and transitional care processes.[8-10]

Legislators took notice of the spiraling costs, potential quality concerns, and undesirable patient outcomes in PAC. Provisions in the Patient Protection and Affordable Care Act of 2010 (ACA), the Protecting Access to Medicare Act of 2014 (PAMA), and the Improving Medicare Post–Acute Care Transformation (IMPACT) Act of 2014 affect patient selection, payment, and quality measurement in PAC. As older adults are increasingly being cared for by hospitalists,[11] hospitalists must be aware of the implications of these reforms.

IMPLICATIONS FOR HOSPITALISTS

Choosing Patients Wisely for PAC

Because PAC-related decision making is not standardized, referral rates vary significantly.[12] The variability in PAC use accounts for 79% of all regional variation in Medicare spending in the United States.[13,14] Compared with other physicians, hospitalists are more likely to use PAC[15] but typically receive little exposure to PAC during training.[16]

The IMPACT Act proposes 2 major changes to patient selection: a uniform assessment tool for patients being discharged to PAC and "site-neutral" payments for PAC. Starting in 2018, the Continuity Assessment Record and Evaluation (CARE) tool must be completed before a hospital discharge in order to better match PAC resources to patient needs. The current 26-page CARE tool includes questions about demographics and home support, medical complexity, physical function, cognitive status, and "transition items," including discharge plans and advance directives. In pilot testing, significant amounts of missing data and average completion times of up to 60 minutes raised concerns about feasibility.[17] CARE tool assessments accurately predicted what form of PAC patients actually received, but further testing is planned to validate whether the type of PAC selected was optimal for patient outcomes.. A plan for using CARE tool assessments to determine site-neutral payments is due to Congress by 2020. In the site-neutral payment system, the PAC provider will be reimbursed according to patient needs (identified by the CARE tool), regardless of PAC setting—a radical change from the current system, in which IRF, SNF, and HHC episodes show major differences in median costs (Table 1).[18]

Hospitalists may be concerned that use of the CARE tool will supplant clinical judgment about patients' PAC needs. The burden of completing the CARE tool could inadvertently reduce the amount of attention hospitalists give to other aspects of a safe discharge rather than lead to the improvement desired.[19-21] Hospitalists will benefit from developing interdisciplinary, iterative workflows to complete the tool, improving accuracy and reducing the burden.

A potential unintended consequence of the site-neutral payment system may be increased difficulty discharging elderly patients who have limited rehabilitation potential but are lacking sufficient social support to return home. In the current system, these patients are commonly discharged to SNFs as a bridge to long-term nursing home care. Hospitalists will need to become increasingly familiar with novel al-

***Address for correspondence and reprint requests:** Robert E. Burke, MD, MS, Research and Hospital Medicine Sections, Denver VA Medical Center, 1055 Clermont St, Denver, CO 80220; Telephone: 303-399-8020 extension 2396; Fax: 303-393-5199; E-mail: robert.burke5@va.gov

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TABLE 1. Overview of Most Common Post–Acute Care Options[18]

	Inpatient Rehabilitation Facility	Skilled Nursing Facility	Home Healthcare Provider
Eligibility	Preceding hospital stay not required, but patient without preceding stay responsible for more cost	Preceding 3-night hospital stay required within 30 days of SNF admission	Preceding hospital stay not required
	Patient requires and can tolerate ≥3 hours of therapy 5 days per week	Patient must have daily skilled nursing or therapy need	Patient must be "homebound" and require intermittent nursing care or therapy
	More than 60% of IRF patients must fit into 1 of 13 proscribed diagnostic categories (eg, stroke)	Many facilities also provide long-term nursing home care, which patients may transition into if they do not rehabilitate successfully	Home healthcare is disbursed in 60-day "episodes," which can be renewed
Payment (Medicare)[a]	Prospective payment by Medicare, single payment per discharge (mean, $18,258)	Prospective payment by Medicare, per diem, not by entire stay (mean, $11,357)	Prospective payment per 60-day episode (mean, $2720)
	Patients pay no additional costs unless coming from community ($1260 up front, $315/day for days 61-90)	Patients have no copayment days 1-20 after hospital discharge, then pay ~$160 per day during days 21-100, then pay full cost. Benefit resets after 60 consecutive days without using Medicare benefit	Patients pay no additional costs
Mean Length of Stay[a]	12.9 days	27.6 days	1.9 episodes (~120 days)
Services Provided	Usually supervised by physical medicine and rehabilitation physician	Usually supervised by geriatrician, nurse practitioner, or physician assistant; providers may work in several facilities	Supervised by primary care physician
	Physical, occupational, and speech therapy, ≥3 hours combined daily	Nursing, physical, occupational, and speech therapy, generally ~1 hour of therapy per day	Nursing, physical, or occupational therapy, average of 33 individual visits by different providers over 60 days

[a]Mean costs and lengths of stay are from 2013 data.[18]

NOTE: Abbreviations: IRF, inpatient rehabilitation facility; SNF, skilled nursing facility.

ternatives to nursing home–based care, such as home-based primary care, medical foster homes, and Medicare/Medicaid's Program of All-Inclusive Care of the Elderly (PACE).[22-25]

Choosing PAC Providers Wisely

Medicare's *Nursing Home Compare* tool (https://www.medicare.gov/nursinghomecompare/search.html) provides a "5-star" system for rating SNFs on several quality metrics; these metrics, however, are not correlated with readmission or mortality rates.[26,27] Improving quality measurement in PAC and tying payment to quality and outcomes are major emphases of the IMPACT Act and PAMA, respectively. PAC providers must publicly report an expanded list of quality measures and outcomes by 2018. In 2017, SNFs will begin reporting rates of "potentially preventable" readmissions, and starting in 2019 they will face penalties for having high risk-adjusted rates.

These reforms coincide with an increased emphasis on hospitals and PAC providers sharing responsibility for costs and outcomes. One model of the Bundled Payments for Care Improvement (BPCI) initiative includes a single payment for an acute hospitalization and PAC up to 90 days after hospital discharge for select conditions. The Medicare Spending Per Beneficiary (MSPB) measure compares hospitals on their spending for Medicare beneficiaries from 3 days before hospital admission to 30 days after hospital discharge, and penalizes outliers with high costs.[28] PAC spending is the main driver of costs in both BPCI and MSPB.[29] One way that hospitals have responded to the BPCI is by drastically reducing their referrals to SNFs and increasing their referrals to HHC providers; unfortunately, this response has resulted in increases in post-discharge emergency department visits.[29,30] Taking a novel step in November 2015, the Centers for Medicare & Medicaid Services (CMS) ruled that hospitals in more than 67 metropolitan service areas will be involuntarily enrolled in the BPCI initiative, using elective lower extremity joint replacement as the sample condition.[31] This ruling signaled that these reforms are not meant solely for "high-performing" hospital and PAC systems able to volunteer for novel models of payment.

These changes have direct implications for hospitalists. Bundled payments incentivize hospitalists to reduce hospital length of stay and choose PAC alternatives with lower costs. SNFs may start accepting fewer "high-risk" patients in order to avoid readmission penalties. Hospitals will need to identify and partner with high-performing PAC providers in their community to maximize outcomes for their patients. On their websites, the Society of Post-Acute and Long-Term Care Medicine (AMDA) lists its state chapters,[32] and the National Association for Home Care & Hospice lists national HHC agencies.[33] Reviewing early lessons learned in the evaluation of PAC providers as potential hospital partners in Pioneer accountable care organizations may be helpful,[34] though the PAC cost savings in these organizations largely resulted from redirecting patients from SNFs to HHC providers.[35,36] In many markets, the relationships between hospitals and PAC providers may become more formalized, leading to vertical integration.[37] Hospitalists may increasingly be asked to work with, or even in, SNFs.[38] For hospitalists who begin working in PAC, the AMDA is developing an educational curriculum to maximize efficacy in a new practice setting.[39] In other markets, hospitals may turn to for-profit entities that provide "integrated post-acute care services,"[40] taking over PAC decision making from inpatient teams and sharing any resulting profits from bundled payments.

TABLE 2. High-Value Areas For Hospitalists to Address Before Discharge to Post–Acute Care

Ideal Transition of Care Domain[a]	Goals	Challenges	References
Discharge Planning	Assess cognitive, functional, and medical impairments as well as social support to match PAC resources to needs	Accurate assessment challenging No clear guidelines for matching needs to resources Hospitalists may have less understanding of PAC capabilities/constraints	16,73-77
Complete Communication of Information	Provide appropriate content in information transfer to PAC	Transfer information may not include elements desired by PAC clinicians (eg medication indications, anticipated completion of time-limited medications) Infrequent documentation of care goals, mental status, and physical function	78-83
Availability, Timeliness, Clarity, and Organization of Information	Transfer information in a timely and efficient manner	Discharge summary arrives after patient PAC and hospital seldom infrequently share electronic medical record PAC clinicians may struggle to reach inpatient clinician to ask questions	84,85
Medication Safety	Effective in-hospital medication reconciliation, accurate list of medications provided to PAC	Medication list often inaccurate Medication list may include medications known to cause adverse events in elderly	8,9,86-90
Educate Patients, Promote Self-Management	Engage patients in their own medical care and functional recovery	Cognitive impairment common Patients and caregivers may struggle to transition after long hospital/post–acute care stay in which care was provided by others	82,91-95
Enlist Help of Social and Community Supports	Identify high-performing PAC providers for collaboration	Medicare "5-star" ratings may not correlate with readmissions and consumer perceptions and may exacerbate disparities Unclear how to identify high-performing sites	8,26,34,96,97
Advance Care Planning	Identify decision maker and care goals; palliative referral when appropriate	Hospitalization often chaotic, patient and caregiver participation difficult Varying levels of comfort among providers who are having these conversations	45,98-102
Coordinating Care Among Team Members	Coordinated evaluation before discharge and with PAC provider	Time-consuming bidirectional barriers to reaching responsible clinician at other care site	78,79
Monitoring and Managing Symptoms After Discharge	Identify and treat acute medical issues before PAC discharge to prevent readmission	External influences to discharge patients to PAC "quicker and sicker" Unclear expectations of level of monitoring PAC can and should provide Limited medical training and increased turnover of frontline PAC staff	2,4,8-10,103,104

[a]Not included is the tenth Ideal Transition of Care domain, Follow-Up With Outpatient Providers, which is more relevant to home discharges.

NOTE: Abbreviation: PAC, post–acute care.

OPPORTUNITIES FOR HOSPITALISTS

Improve Hospital and Transitional Care to Ensure Successful Early Outcomes in PAC

Payment reform ensures hospitalists will increasingly have a stake in these matters, as joint responsibility for costs and outcomes increases for patients discharged to PAC. Hospitalists play a major role in these outcomes by deciding when and where to discharge patients and ensuring that optimal transition-of-care processes are used.[8-10,41-45] Although no single intervention has been prospectively found to improve hospital-to-PAC transitional care outcomes, areas in need of improvement are known. Table 2 lists these within 9 of the Ideal Transition of Care Framework domains.[43,46]

Advocate Patient-Centered PAC Placement That Maximizes Long-Term Outcomes

Payment reforms could reinforce the cynical view that the optimal PAC setting is the least costly one that avoids hospital readmission. This view does not incorporate evidence that, in some cases, placement in a more costly PAC setting results in better long-term outcomes (eg, community discharge rates).[47,48] It is also incongruent with a holistic view of the patient's needs, particularly for patients who may otherwise be suitable for home-based PAC but have limited social support.[49] Finally, it does not acknowledge the reality that patients who are inadequately rehabilitated often transition to long-term nursing home care,[50] which could result in significant cost-shifting from Medicare to Medicaid, the predominant payer for long-term care.[51] Given the extraordinary cost of long-term nursing home care, attending only to short-term costs and outcomes could increase national healthcare expenditures.

With most PAC-related decisions being made in the hospital, hospitalists find themselves at the center of a care team that must advocate the PAC that is best for the patient over the long term. This endeavor requires that hospitalists and others work for improvements in at least 3 aspects of in-hospital care. First, systems for accurately and reliably identifying patient factors that could substantially affect ability to rehabilitate (eg delirium) must be developed or enhanced.[52-54] Second, more formal evaluation of the ability of patients and their caregivers to succeed at home is needed.[55-60] Patients and caregivers may not understand their home needs without first "testing" the experience prior to discharge.[61] Third, hospitalists must understand PAC in order to provide safe transitions.[16] It is logistically challenging to expose practicing hospitalists to PAC, and it is unclear which exposures are most effective in improving decision making.[62] An alternative approach that provides hospitalists with feedback about the short- and long-term outcomes of patients they have discharged to PAC may iteratively improve decision making. However, despite the high rate of

discharges to PAC, there are anecdotal reports that few hospitalists receive feedback on patient outcomes.

As these reforms are tested and implemented, advocacy at regional and national levels is needed. The American Geriatrics Society (AGS), the AMDA, and the American Academy of Home Care Medicine all have well-developed advocacy platforms hospitalists can access.[63-65]

Share Expertise to Improve Quality in a Constrained Environment

There are opportunities for synergy between robust quality improvement (QI) efforts in PAC (often as part of Quality Assurance and Performance Improvement programs) and similarly robust hospital QI efforts led by hospitalists.[66-70] These efforts have largely occurred in parallel, but now some important bridging QI interventions (eg, collaborative root cause analyses for patients readmitted after PAC) are starting at some sites, and these may drive improvement across the care spectrum.[45] The Society of Hospital Medicine, the AGS, and the AMDA have written White Papers on care transitions that may serve as starting points for discussion.[41,71,72]

CONCLUSION

PAC is rapidly changing in response to reform legislation that is intended to address poor outcomes and high costs. Hospitalists will increasingly feel the effects of these reforms in their day-to-day practices. To continue to deliver high-value care, hospitalists should review their in-hospital and transitional care practices and start building relationships with high-quality PAC providers in their community.

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Getting Warmer

The approach to clinical conundrums by an expert clinician is revealed through the presentation of an actual patient's case in an approach typical of a morning report. Similarly to patient care, sequential pieces of information are provided to the clinician, who is unfamiliar with the case. The focus is on the thought processes of both the clinical team caring for the patient and the discussant.

This icon represents the patient's case. Each paragraph that follows represents the discussant's thoughts.

Shaili Rajput, MD, MPH[1]*, John Schmidt, MD[2], Jennifer Stojan, MD[2], Callistus Ditah, MD[3], Nathan Houchens, MD[4]

[1]Department of Pediatrics, University of Michigan, Ann Arbor, Michigan; [2]Departments of Internal Medicine and Pediatrics, University of Michigan, Ann Arbor, Michigan; [3]General Surgery Residency Program, University of Wisconsin, Madison, Wisconsin; [4]Department of Internal Medicine, University of Michigan and Veterans Affairs Ann Arbor Healthcare System, Ann Arbor, Michigan.

A 3-month-old otherwise healthy, immunized female presented to clinic with 2 days of intermittent low-grade fevers (maximum, 100° F), decreased oral intake, and sleepiness. Her pediatrician noted a faint, maculopapular rash on her trunk and extremities with mild conjunctival injection bilaterally that appeared that day, according to her mother. The infant otherwise appeared alert, well-hydrated, and without respiratory distress. She had no history of sick contacts or recent travel. She was prescribed amoxicillin for empiric treatment of a possible bacterial sinusitis or pharyngitis, despite a negative rapid strep antigen test.

At this age, multiple conditions can cause rashes. Given that this is early in the course of illness, without focal symptoms but with low-grade fevers, the initial differential diagnosis is broad and would include infectious, rheumatologic, and hematologic-oncologic etiologies, although the latter would be less likely. While the patient's mother reports decreased oral intake, the fact that the patient is alert and appears hydrated is encouraging, suggesting time to observe and see if other symptoms present that may assist in elucidating the cause. The history of increased sleepiness warrants further investigation of meningeal signs, which would point to a central nervous system infection.

While streptococcal infection is possible, it would be uncommon at this age. The patient would have a higher fever and focal infection, and the rash does not appear consistent unless it was described as "sandpaper" in feel and appearance. A negative rapid strep test, while not sensitive, further supports this impression. A low-grade fever and rash would be consistent with a viral syndrome and, given the conjunctival injection, adenovirus, cytomegalovirus, rhinovirus, and Epstein Barr virus (EBV) are possibilities. Without ocular discharge, bacterial conjunctivitis would be unlikely. Another consideration would be Kawasaki disease, though it would be too early to diagnose this condition since at least 5 days of fever are required. Next steps include a detailed physical examination, looking for other focal signs such as swelling or desquamation of hands and feet, lymphadenopathy, strawberry tongue, and mucositis. Rather than empirically starting antibiotics, it would be more reasonable to observe her with close outpatient follow-up. The patient's family should be instructed to monitor for additional and/or worsening symptoms, further decreased oral intake, signs of dehydration, or changes in alertness.

At home, the patient completed 5 doses of amoxicillin but continued to be febrile (maximum, 102.6° F). She was taken to a local emergency department on day 6 of her illness. She had worsening conjunctival injection and progression of the rash, involving the palms and soles. She was noted to have edema of hands and feet without desquamation (Figure 1). She had no oral mucous membrane changes and no cervical lymphadenopathy. Cerebrospinal fluid (CSF) was unremarkable, and empiric treatment with intravenous (IV) ceftriaxone was initiated. Complete blood count was notable for a white blood cell (WBC) count of 18.9 k/μL (normal range, 6.0-17.0); hemoglobin, 7.6 g/dL (normal range, 10-13); mean corpuscular volume, 84 (normal range, 74-108); and platelet count, 105 k/μL (normal range, 150-400). A peripheral blood smear revealed no abnormal cells. C-reactive protein (CRP) was

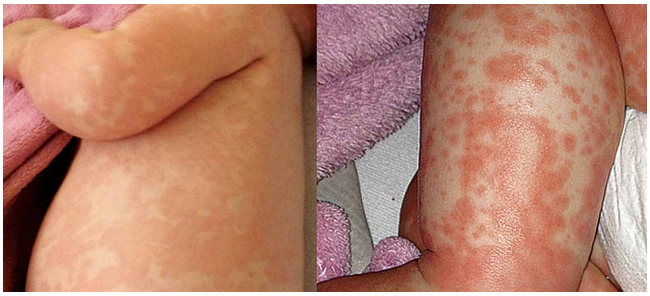

FIG. 1. Fine, erythematous, blanching maculopapular rash involving the palms and the soles with associated edema.

***Address for Correspondence and Reprint Requests:** Shaili Rajput, MD, MPH, 1885 Bay Road, East Palo Alto, CA 94301; Telephone: 650-383-2342; Fax: 650-321-1610; Email: shaili.rajput@gmail.com

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elevated at 6.5 mg/dL (normal range, 0.0-0.6). She was admitted for further management.

Infection remains on the differential diagnosis given the elevated WBC count. Since the patient has completed a reasonable course of antibiotics, a bacterial infection would be less likely but not fully excluded. The cultures obtained would be helpful if they become positive, but given that the patient has been on antibiotics, a negative culture may represent partial sterilization and would not rule out infection. A viral infection continues to be high on the differential, but one would expect that symptoms and fever would have begun to abate. The normal peripheral blood smear makes a hematologic disorder less likely.

Kawasaki disease has risen on the differential with 5 days of fever surpassing 102° F. She has 3 of 5 primary clinical criteria, including conjunctival injection, rash, and edema of the hands and feet. Desquamation of the peripheral extremities would not be expected until the convalescent phase. A diagnosis of typical Kawasaki disease would require a fourth criterion, either oral mucous membrane changes or cervical lymphadenopathy. She meets the criteria for atypical or incomplete Kawasaki disease, which requires only fever for at least 5 days, elevated CRP, and 2 or 3 additional clinical criteria. She also meets supplemental laboratory criteria with an elevated WBC count greater than 15,000/μL, normocytic and normochromic anemia for age, and elevated CRP. Urinalysis positive for pyuria or serum albumin less than 3 g/dL would lend further support but is not necessary. Fever of 7 or more days in a child less than 6 months old without other explanation would also increase the likelihood of incomplete Kawasaki disease. Admission to the hospital, treatment with IV immunoglobulin (IVIg), and echocardiography to evaluate for typical cardiac involvement (eg, aneurysms, coronary arteritis, and pericardial effusion) are the appropriate next steps.

The patient was diagnosed with atypical Kawasaki disease. A transthoracic echocardiogram was normal on admission. On day 7 of her illness, she was treated with 1 dose of IVIg at 2 g/kg and high-dose aspirin at 100 mg/kg per day in divided doses. Despite this treatment, she continued to be febrile and was given a second dose of IVIg on day 9. Her fevers persisted.

In Kawasaki disease, persistent fever is concerning for long-term sequelae, including coronary artery aneurysms. Continued treatment is reasonable. After 2 doses of IVIg with a cumulative dose of 4 g/kg, it is prudent to switch therapy to IV methylprednisolone 30mg/kg with repeated doses as needed for up to 3 days should her fevers persist.

Her blood culture was negative. EBV serology, enterovirus polymerase chain reaction, and viral cultures were negative. Chest radiography on day 9 was normal. Abdominal ultrasonography on day 10 showed hydrops of the gallbladder.

The patient was started on IV corticosteroids on day 11 with resolution of her fevers and improvement in her rash. A repeat echocardiogram revealed new findings of dilated left main, left anterior descending, and right coronary arteries. On day 13, a steroid wean was attempted because she had remained afebrile for more than 48 hours, but the wean was halted due to recurrence of fevers and rash. Her high-dose aspirin was reduced to 81 mg PO daily on day 14, and she was started on enoxaparin injections.

It is unusual for Kawasaki disease not to respond to 2 doses of IVIg, followed by corticosteroids. As such, the differential diagnosis must be revisited. The findings of coronary artery dilation, prolonged fever, and rash corroborate the diagnosis of Kawasaki disease, although this could be an atypical presentation of another vasculitis. Systemic onset juvenile idiopathic arthritis usually affects children at 2 to 5 years old and is, therefore, less likely. Henoch-Schönlein purpura manifests with a rash but is often associated with diarrhea. There does not appear to be objective evidence of polyarteritis nodosa, although biopsy or angiography would be required to make this diagnosis. Hydrops of the gallbladder is an over-distention of the organ filled with watery or mucoid content. While hydrops can be noninflammatory and seen in gallstone disease, it can also occur in vasculitides. Despite the reassuring serologies, false negative results are possible. Thus, these viral infections are not eliminated, but they are less likely. Given the echocardiogram findings and continued concern for atypical Kawasaki disease, high-dose aspirin should be continued. It is reasonable to consider rheumatology consultation for assessment and recommendations as to length of steroid treatment and/or alternative interventions.

Pediatric cardiology was consulted. Repeat echocardiogram on day 16 showed an increase in the size of her coronary artery aneurysms, and her fevers persisted. Computed tomography scan of the abdomen and pelvis with contrast, obtained to further evaluate for a source of infection, was unremarkable.

The patient was transferred to a tertiary care institution on day 19, at which time she remained on aspirin, enoxaparin, and oral corticosteroids. On arrival, her temperature was 101.3° F, heart rate 225 beats per minute, and respiratory rate 57 breaths per minute. She was fussy with bilateral conjunctivitis and a maculopapular rash involving palms, soles, and right infraorbital region. Laboratory studies were significant for a WBC count of 30.3 k/μL; hemoglobin, 10.9 g/dL; platelets, 106 k/μL; and CRP, 8.3 mg/dL.

Pediatric rheumatology was consulted on day 20. The patient was treated with 3 days IV pulse-dose methylprednisolone at 30 mg/kg daily. Her fevers resolved, although her CRP level remained elevated. She was treated with 1 dose of infliximab 10 mg/kg IV on day 24, followed by 1 dose of anakinra 15 mg subcutaneously on day 27 due to persistently elevated CRP.

The symptoms and diagnostic evaluation remain most consistent with atypical Kawasaki disease. Her tachycardia and tachypnea are likely driven by her fever and fussiness, and should be followed closely. The elevated WBC is likely a consequence of the steroids and demargination of neutrophils. The elevated and increasing CRP is a marker of acute inflammation. The adage "treat the patient, not the numbers" comes to mind, because it is reassuring that the patient's overall clinical picture seems to be improving with resolution of her fevers. However, further discussion with the pediatric rheumatology consultant is prudent, specifically regarding the significance of the persistently elevated CRP, refinement of the differential diagnosis including the potential for other vasculitides and appropriate evaluation of such, as well as recommendations for further treatment.

The patient was noted to have ongoing fevers. Based on reports of success with cyclophosphamide in refractory Kawasaki disease, she was treated with 2 doses at 60 mg IV per dose starting on day 28. Her CRP level decreased. Cardiology and rheumatology consultants recommended magnetic resonance imaging/magnetic resonance angiography of the chest, abdomen, and pelvis with and without contrast. These studies revealed dilation of the axillary and brachial arteries (Figure 2).

The response to cyclophosphamide confirms an autoimmune/inflammatory process. The imaging results and pattern are most consistent with either Kawasaki disease or polyarteritis nodosa. Therefore, rheumatology's input will be invaluable with regard to which diagnosis is most likely, additional diagnostic testing, and appropriate medical regimen and follow-up plans.

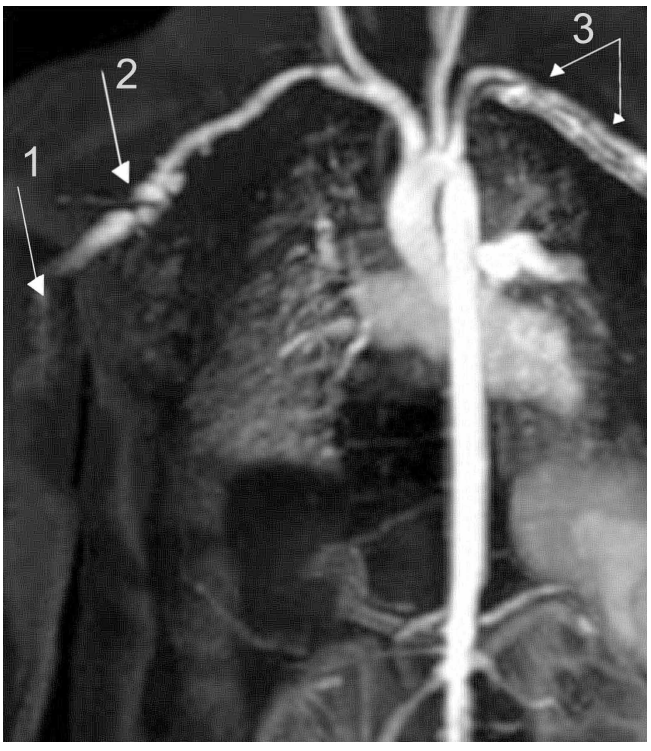

FIG. 2. Tortuous and aneurysmal dilation of the right proximal brachial artery (Arrow 1) and axillary artery (Arrow 2), and probable left axillary dilation (Arrow 3).

Systemic extracoronary vascular inflammation on imaging and the refractory nature of the patient's disease process, despite appropriate treatment for Kawasaki disease, led to the diagnosis of childhood polyarteritis nodosa (PAN). The patient was discharged home and closely followed in rheumatology clinic. Her most recent outpatient visit 1 year after the initial onset of her illness showed no further fevers or rashes, normal inflammatory markers, and stabilization of her coronary aneurysms on daily maintenance azathioprine.

DISCUSSION

Fever with an accompanying rash is a common issue in children. The extensive differential diagnosis includes infectious diseases, rheumatologic disorders, and medication reactions (Table 1). A thorough history and physical examination are essential in guiding the physician toward the proper diagnosis and management. Important information includes patient age, season, associated symptoms, exposure to sick contacts, travel history, host immune status, and immunization history. Fever duration and pattern must be elicited, as should features of the rash, including temporal relationship to the fever, distribution, progression, and morphology.[1]

When unexplained fever persists for 5 days or more in the pediatric patient, the diagnosis of KD must be suspected. KD is an acute, febrile, primary systemic vasculitis affecting small- and medium-sized vessels, with a predilection for coronary arteries.[2] KD affects younger children, with approximately 85% of cases occurring in children under 5 years old.

TABLE 1. Common Causes of Fever with Accompanying Rash in Children

Viral infections	Measles
	Rubella
	Roseola (human herpesvirus 6 and 7)
	Erythema infectiosum (parvovirus)
	Epstein-Barr virus
	Cytomegalovirus
	Other nonspecific viral illnesses
Bacterial infections	Scarlet fever
	Lyme disease
	Rocky Mountain spotted fever
Rheumatologic disorders	Acute rheumatic fever
	Systemic juvenile idiopathic arthritis
	Kawasaki disease
	Polyarteritis nodosa
	Henoch-Schönlein purpura
Medication reactions	Erythema multiforme
	Stevens-Johnson syndrome/toxic epidermal necrolysis
	Drug reaction with eosinophilia and systemic symptoms (DRESS) syndrome

TABLE 2. Diagnostic Criteria of Kawasaki Disease and Childhood Polyarteritis Nodosa

Kawasaki Disease
Fever of at least 5 days' duration *plus* at least *4* of the following:
• Polymorphous exanthema
• Bilateral conjunctival injection with limbic sparing
• Cervical lymphadenopathy >1.5 cm in diameter
• Lip and oral cavity changes (erythema, cracked lips, strawberry tongue)
• Extremity changes (erythema of palms and soles, edema, later desquamation)
Childhood Polyarteritis Nodosa
Biopsy showing small- and medium-sized artery necrotizing vasculitis ***or*** aneurysms or occlusions on angiography *plus* at least *1* of the following:
• Skin involvement (livedo reticularis, nonspecific vasculitis lesions, tender subcutaneous nodules)
• Myalgia or muscle tenderness
• Mononeuropathy or polyneuropathy
• Systemic hypertension
• Renal involvement (proteinuria, hematuria, red blood cell casts, or GFR <50% normal value for age)

NOTE: Abbreviation: GFR, glomerular filtration rate.

KD has a higher incidence in Asian populations, suggesting a possible genetic predisposition.[3] The etiology of KD is not well understood, but infection and immune dysregulation have been proposed as contributing factors. KD is the leading cause of acquired heart disease in developed countries.[2]

The diagnosis of KD is made clinically (Table 2). Atypical KD is considered in patients with at least 5 days of fever but only 2 or 3 clinical criteria. Supportive laboratory findings include elevated inflammatory markers, anemia, neutrophilia, abnormal plasma lipids, low albumin, sterile pyuria, CSF pleocytosis, and elevated serum transaminases. Two-dimensional echocardiography should be performed in all children with definite or suspected KD at the time of diagnosis, 1 to 2 weeks later, and 6 weeks following discharge for evaluation of the coronary arteries, left ventricular function, and valve function. The American Heart Association recommends follow-up echocardiography at 1 year in children without coronary vessel involvement.[4]

Treatment is aimed at minimizing inflammation and coronary artery involvement, and should be initiated promptly.[5] Therapy includes a single infusion of high-dose IVIg and aspirin;[6,7] the latter is initially provided at high anti-inflammatory doses, followed by lower antithrombotic doses once fever and laboratory markers have resolved.[2] Aspirin can be discontinued if there is no evidence of coronary involvement at the 6-week follow-up echocardiogram.[5] A second dose of IVIg is given within 48 hours for refractory cases, defined as persistent fever following the first dose of IVIg.[4] Fifteen percent of children have refractory illness, and refractory KD is associated with a higher risk of coronary artery lesions.[5] Additional agents that suppress immune activation and cytokine secretion contributing to KD pathogenesis have been studied. Corticosteroids inhibit phospholipase A, an enzyme required for production of inflammatory markers.[8] Infliximab, a tumor necrosis factor-alpha inhibitor, has been shown to reduce duration of fever and length of hospital stay.[8,9] Anakinra, an interleukin-1 receptor antagonist, has been shown to decrease fever duration and prevent progression of vascular injury in cases of refractory KD.[10] There is, however, a lack of sufficient evidence and consensus on best practice.[8-10]

If inflammation, evidenced by fever, elevated inflammatory markers (such as erythrocyte sedimentation rate, CRP), or vessel involvement on imaging, persists or worsens despite standard therapy, physicians should seek alternative diagnoses. This patient's extracoronary vascular inflammation and favorable response only to cyclophosphamide led to the diagnosis of systemic PAN. Like KD, PAN is a multi-system vasculitis affecting small- and medium-sized vessels. Unlike KD, PAN is rarely seen in children.[11] Historically, PAN was thought to represent an extreme fatal end of the KD spectrum. Today, PAN is accepted as a separate entity. Clinical features and histological findings often overlap with KD, creating a diagnostic dilemma for providers.[12]

At the onset of illness, clinical features of systemic PAN may include recurrent fever, weight loss, and myalgia, with gradual progression to multi-organ system involvement. Laboratory assessment reveals elevated inflammatory markers and leukocytosis. Thrombocytosis, anemia, proteinuria, and hematuria may be present. A positive antineutrophil cytoplasmic antibody is rare in PAN and should raise suspicion for a microscopic polyangiitis, which is distinguished from PAN by small vessel involvement only. When compared to KD, cardiac vessel involvement in PAN is more variable.[11] Diagnostic criteria for childhood PAN are listed in Table 2.[13]

Treatment of PAN is aimed at inducing remission with high-dose steroids and cyclophosphamide. Maintenance of remission is achieved using low-dose steroids and azathioprine.[11] Total duration of treatment averages 2 to 3 years, with a minimum of 18 months.[14] Plasma exchange has been used in severe, life-threatening cases.[11] Prognosis for children with PAN is more favorable compared to adults with PAN, in whom the mortality rate is as high as 20% to 30%, even with aggressive treatment. In 1 multicenter study of childhood and adolescent PAN, overall mortality was 1.1%.[15]

This patient initially presented with findings consistent with KD. As her inflammatory markers remained elevated and fevers persisted, her physicians appropriately reconsidered the etiology of her symptoms, thereby "getting warmer" in the search for the correct diagnosis of systemic PAN, a rare disease and a separate entity from KD. Recognizing the overlapping and distinct clinical features of each entity can promote more timely and appropriate selection of therapy, thereby minimizing clinical manifestations and complications associated with each vasculitis.

KEY TEACHING POINTS

- KD and childhood PAN are disseminated vasculitides affecting small- and medium-sized vessels. Although they are distinct entities, KD and PAN exhibit overlapping clinical and pathological features that make appropriate

diagnosis and treatment challenging.

- In cases of refractory KD, alternative diagnoses should be considered.
- Recognizing the individual features of both entities is imperative because treatment differs: KD is treated with high-dose aspirin and IVIg; corticosteroids and immunosuppressive agents are used to treat PAN.

Disclosure: Nothing to report.

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A Problem of Capacity, but Whose? The Hospitalists' Discharge Dilemma and Social Determinants of Health

Hilary J. Mosher, MFA, MD[1,2*], Laurel J. Lyckholm, MD[2]

[1]Center for Comprehensive Access and Delivery Research and Evaluation (CADRE), Iowa City VA Healthcare System, Iowa City, Iowa; [2]Department of Internal Medicine, University of Iowa Carver College of Medicine, Iowa City, Iowa.

For a number of years, those challenged with improving discharge transitions and preventing readmissions have suggested more—more case managers, more checklists and systems, more discharge pharmacists; and better—better communication, better medication reconciliation, better discharge documentation, better follow-up. In a study by Chan Carusone et al.,[1] high-need, high-complexity patients receiving treatment at Casey House, a specialized urban hospital providing inpatient and community programs, were afforded a full complement of discharge planning and post-hospitalization services. Despite these services, the patients achieved little success in maintaining their health and following their discharge plans after hospitalization.

This longitudinal qualitative study detailing the lived experience of discharge extends our knowledge of challenges faced by patients during the posthospital transition,[2] and further elucidates the differences between patients' expectations and assessments of their resources and goals, and their actual abilities and priorities on discharge. Despite substantial assistance, including housing, food assistance, and case management, Chan Carusone et al. found that the exigencies of day-to-day existence exceeded the patients' capacities to sustain themselves outside the hospital. This failure implies a question: If the interventions alluded to in this study were not enough, then how much more, and how much better, is needed?

Attention to this question of how to best serve high-need patients continues to increase,[3] and success in intervening to improve care transitions for this population is limited,[4] in part because providing more care and more coordination requires more resources. Observing the challenges that remain for patients treated in the highly-resourced setting that is Casey House, the authors propose a previously described theoretical construct, minimally disruptive medicine (MDM),[5] as a framework to guide patients and providers in creating a discharge plan that relies on the patient's capacity to integrate disease self-management into his or her daily circumstances. MDM hinges on the concept of balancing workload and capacity: the burden of managing disease with the resources and abilities to do so. On first consideration, this seems an attractive approach to operationalizing patient-centered care by tailoring a discharge plan to a patient's goals and capacities. On closer examination, however, MDM, applied to a single transition episode, raises some important concerns.

As Chan Carusone et al. describe, patients may poorly judge their future resources and capacity when making decisions in the hospital setting. Likewise, physicians and other team members may lack insight, perspective, and detailed knowledge of resources and barriers in the outpatient setting. From their vantage point, they may not see the fragile contingencies of the discharge plan that is reflected in the patients' spoken words. At any moment, a well-meant, seemingly well-crafted discharge plan could fall apart.

Within the walls of the hospital, we tend to perform what might be termed maximally disruptive medicine—the treatments provided are exactly those that can't be delivered in a nonhospital setting. For many patients, these interventions are not curative, but rather stabilizing;[6] we assuage chronic conditions that had become exacerbated by new illness, disease progression, or conditions outside the hospital. To return the patient to his or her home situation, especially one that is under-resourced, with minimized workload can feel counterproductive and demoralizing at best. What prevents one from worrying that, where capacity can't be improved, planning for MDM is, in essence, planning for minimal care?

Viewed in the broader context of a life course health development framework,[7] which integrates biological, psychological, cultural, and historical experience to explain the development of health trajectories over an individual's lifetime, a minimally disruptive approach might be viewed as amplifying disparities. The patients contributing to the study by Chan Carusone et al. may have arrived in their respective situations through a life course marked by poverty, violence, inadequate housing, poor nutrition, discrimination, and other disadvantages that may have resulted from accident, malfeasance, or choice. Their limited personal capacity and the ongoing chaos that is reflected in many of their comments requires that discharge planning uses imagination and dialogue, with careful, compassionate listening by providers, and close partnering and decision-making by patient and providers. Approaches to building the capacity for such compassion, as well as structural interventions to provide care that is necessary and just for these most vulnerable patients by considering their experiences and beliefs,[8] remain to be articulated.

***Address for correspondence and reprint requests:** Hilary J. Mosher, MFA, MD, Iowa City VA Healthcare System, 601 Highway 6 West, Mailstop 111, Iowa City, IA, 52246-2208; Telephone: 319-338-0581, ext 7723; Fax: 319-887-4932; E-mail: hilary.mosher@va.gov

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In a sense, the narrative unfolded by Chan Carusone et al. appropriately emphasizes that care transitions contain both complex problems and "wicked" problems.[9] While aspects of transitions are complex and can be reasonably addressed with complex solutions, these same complex solutions are inadequate to mitigate the seemingly intractable socioeconomic challenges that drive hospital dependence for many high-need patients. Addressing these likely requires a reexamination of what we expect from hospitals, what systems we are able to design and are willing to support to keep people from returning to them, and what it means that for some people returning is the best, and sometimes only, thing to do.

As we continue to seek new models for healthcare in high-need, high-risk populations, we may do well to focus further longitudinal qualitative study on building a deep understanding of when and how patients achieve success following discharge. What characterizes patients, caregivers, service networks, and communities in healthcare settings with the highest rates of effective transitions? Maintaining equilibrium outside an institutional setting is convoluted, time-consuming, nuanced, and taxing; that those who have not experienced doing so as a patient or caregiver might struggle to help others should not surprise us. The concepts of capacity and workload lend themselves to structuring discovery of the resources that patients, not providers and policy-makers, have found through their lived experience to be most crucial to their enduring well-being. Learning from these experiences may shift the balance by increasing our own capacity to understand what constitutes success.

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Improving Quality in Against Medical Advice Discharges—More Empirical Evidence, Enhanced Professional Education, and Directed Systems Changes

David Alfandre, MD, MSPH*

National Center for Ethics in Health Care, U.S. Department of Veterans Affairs, Washington, DC; Assistant Professor of Medicine and Population Health, NYU School of Medicine, New York, New York.

Against Medical Advice (AMA) discharges, when a patient chooses to leave the hospital prior to a clinically specified and physician recommended endpoint, remain a healthcare quality problem. Patients who leave the hospital AMA challenge the healthcare professionals entrusted to care for them as well as the institutions that work to promote continuity and improved quality. AMA discharges account for up to 2% of all hospital discharges and, compared with conventional discharges, are associated with worse health and health services outcomes. Patients discharged AMA have higher rates of 30-day readmission, morbidity, and 30-day mortality.[1,2] Additionally, the burden of worse health outcomes is disproportionate among disadvantaged patient populations. Patients with human immunodeficiency virus,[3] substance use disorders,[4] and psychiatric illness[5] are more likely to be discharged AMA, as are patients with low socioeconomic status, without insurance, or with Medicaid insurance.

In this issue of the *Journal of Hospital Medicine*, Stearns and colleagues[6] provide an important contribution to this area of medicine in need of more high quality empiric studies. The study reviewed all AMA discharges from a single year in an urban community hospital in order to assess provider perceptions and knowledge about AMA discharges. The study reconfirmed both the patient-level predictors of AMA discharges that have been demonstrated consistently (ie, male gender, younger age, Medicare or no insurance, and injection drug use) as well as the low rates of documentation of patient capacity, medication prescribed, and follow-up plans in AMA discharges.[7]

The authors' investigation has also advanced the study of AMA discharges in two important directions. First, by characterizing patients with multiple AMA discharges, the authors focus on a more vulnerable population. These patients, who may have particular difficulty in consistently engaging in care, could help provide insight into the general phenomenon of AMA discharges. Second, the authors broadened their attention to include the study of nurses, a group of healthcare professionals who may play an important but not well recognized role in the AMA discharge process. In further characterizing nurses' attitudes toward AMA discharges, medication prescriptions, and outpatient follow-up, the authors highlight nurses' role in gathering critical patient information and promoting ethical practices in discharge planning. To better understand this dynamic and its potential role in mediating adverse health outcomes, further studies should also examine the attitudes of other central members of the treatment team (eg, pharmacists, social workers, etc.) who participate in discharge planning.

Inadequate documentation of AMA discharges remains a problem. In an attempt to address this, some institutions use AMA discharge forms to facilitate documentation of the informed consent process, the patient's signed declination of care, medico-legal considerations, and the resulting treatment plan. Although systematic efforts to improve documentation should be encouraged, significant uncertainty about the optimal use of AMA discharge forms remains. Specifically, the use of a patient-signed AMA discharge form has not been demonstrated to advance patient care and may promote harm by stigmatizing patients[8] and reducing the likelihood that they will pursue follow-up care.[9] Furthermore, given that these forms may be written using institution-centered legalistic language or at an inappropriate reading level, this common hospital practice should be evaluated to assess whether patients comprehend and benefit from the forms, and how the forms influence healthcare decision making.[10]

Finally, the authors' finding that 38% of nurses, 22% of physician trainees, and 6% of attendings believe patients discharged AMA lose the "right" to follow-up is noteworthy. The practice would suggest a significant lapse in understanding the professional obligation to acknowledge and communicate that the informed consent process is voluntary and patients have the right to decline recommended treatment without forfeiting future access to care. Harm reduction principles indicate that simply choosing to decline an episode of inpatient care does not make a patient ineligible for other medically indicated treatments and services. Previous studies have demonstrated that physicians may incorrectly inform patients that insurance will not pay for their care if they leave AMA, in order to persuade them to remain hospitalized.[11] The current study suggests similar and potentially well-meaning but coercive attitudes about AMA discharge that can undermine a patient's voluntary choice to accept medical care.

Stearns and colleagues[6] rightly point to educational and policy interventions to improve the quality of care for pa-

***Address for correspondence and reprint requests:** David Alfandre, MD, 423 East 23rd St., 10E1E, New York, NY 10010; Telephone: 212-951-3306; Fax: 212-951-3353; E-mail: david.alfandre@va.gov

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tients discharged AMA. Additionally, setting patients' expectations early in the hospitalization,[12] empathically addressing their concerns,[13] and sharing clinical decisions with patients by providing a medically reasonable range of clinical options rather than a single choice[14] are practical bedside interventions that all clinicians can implement. System changes like developing clear policies and electronic medical records templates are particularly important, as they are more likely to lead to durable institutional change that is systematic, transparent, and fair. Moreover, research that expands the object of study beyond the physician-patient relationship could significantly improve outcomes in this vulnerable population of patients. Recent studies have begun to elucidate the deficiencies that may underlie communication failures with patients before they choose to leave AMA,[15] how providers decide to designate a discharge as AMA,[16] and how changing the structure and environment of care for patients who use injection drugs can reduce AMA discharges and improve health outcomes.[17]

AMA discharges are a persistent, complicated healthcare quality problem that defies an easy solution. Improving the quality of care for these patients will require building upon the empirical research base, providing enhanced education and guidance to healthcare professionals in the ethical and clinical management of AMA discharges, and making systems changes that promote enduring institutional change. We are moving in the right direction, but we have further to go.

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In Reference to "Pilot Study Aiming to Support Sleep Quality and Duration During Hospitalizations"

Nolan R. Machado, BA[1], Samantha L. Anderson, BA[2], Vineet M. Arora, MD, MAPP[2]

[1]University of Chicago Pritzker School of Medicine, Chicago, Illinois; [2]University of Chicago Medicine, Department of Medicine, Section of General Internal Medicine, Chicago, Illinois.

We commend Gathecha et al.[1] on the implementation of a well-formed, multicomponent sleep intervention to improve sleep in hospitalized patients. While they were unable to show objective improvement in sleep outcomes, they found improvements in patient-reported sleep outcomes across hospital days, implying that multiple hospital nights are needed to realize the benefits. We wish to propose an alternative strategy. To produce a more observable and immediate improvement in patient sleep outcomes, the behavioral economics principle of nudges[2] could be an effective way to influence hospital staff toward sleep-promoting practices.

In focus groups at the University of Chicago Medicine, nurses, hospitalists, and residents reported unnecessary nocturnal disruptions were the "default" option hardwired in electronic medical records admission order sets. It was time-consuming to enter orders that minimized unnecessary nocturnal disruptions, such as forgo overnight vitals for stable patients. Given that changing default settings of order sets have been shown to effectively nudge physicians in other areas,[3-5] altering default settings in admission orders could facilitate physicians' adherence to sleep-promoting practices. An intervention combining these nudges with educational initiatives may be more effective in sustained reductions in nocturnal disruptions and improved inpatient sleep from the start of a hospital stay.

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The Authors Reply, "Pilot Study Aiming to Support Sleep Quality and Duration During Hospitalizations"

Evelyn Gathecha, MD[1], Scott Wright, MD[1,2]

[1]Johns Hopkins University, School of Medicine, [2]Johns Hopkins Bayview Medical Center, Division of General Internal Medicine, Baltimore Maryland

We thank the authors for their comments and thoughts about our recent publication.[1] Their suggestion that the incorporation of principles from the "Nudge Theory" might enhance the impact of our sleep intervention and shorten the lag time until patients appreciate the benefits is interesting.[2] Our study aimed to assess the effect of a sleep-promoting intervention on sleep quality and duration among hospitalized patients within a quasi-experimental prospective study design. As is the case at the University of Chicago hospital described in Machado's letter, nocturnal disruptions are also the "default" in order sets in our electronic medical records (EMR). Because the EMR team at our hospital is stretched thin with more requests than it can fulfill, it was not feasible or possible to incorporate any sleep supporting changes when designing the pilot.

Complementing sleep-promoting procedures for hospitalized patients with "nudge" principles, such as the use of choice architecture with appropriate EMR defaults or even incentives and mappings, seems like a wise recommendation.[3] Regular nudges may be helpful for sustaining any multicomponent interventions in healthcare delivery that rely on cooperation by multiple parties. It appears as if evidence is growing that "nudge principles" can augment behavior change attributable to interventions.[4,5] Sleep-promoting nudges, namely "anti-nudges" by members of the healthcare team, should help patients to sleep better during their hospitalizations, when sleep is critically important to recovery and health restitution.

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