

Optimizing Patients' Vital Interests Post-Discharge

Katherine L. Kahn, MD^{1,2}

¹Division of General Internal Medicine and Health Services Research, David Geffen School of Medicine at University of California, Los Angeles, CA, USA; ²RAND Corporation, Santa Monica, CA, USA.

J Gen Intern Med 32(1):14–6
DOI: 10.1007/s11606-016-3876-y
© Society of General Internal Medicine 2016

In this issue of *JGIM*, Nguyen et al. present empirical evidence highlighting the potential value of using a patient's instability at hospital discharge as a diagnostic test to predict the likelihood of future adverse events.¹ Based upon prior empirical evidence regarding the role of abnormal vital signs in predicting vital status,^{2–4} the authors define instability at hospital discharge as temperature ≥ 37.8 °C, heart rate ≥ 100 beats per minute, respiratory rate > 24 breaths per minute, systolic blood pressure ≤ 90 mmHg, or oxygen saturation < 90 %. Using electronic health record data for adults hospitalized during 2009 and 2010 in their six-center observational cohort study, the authors demonstrate that almost one in five general medicine patients was discharged with at least one documented vital sign instability within 24 h prior to discharge. Among those with fever on the day of discharge, 38 % had fever at admission, and among those with tachycardia at discharge, 76 % had the unstable sign at discharge.

Learning that patients are sick at admission reassures us that hospital resources are allocated for patients with (often multiple) health needs that may benefit from the intense clinical and technological data-gathering, decision-making, treatment, and surveillance that hospitals offer. However, learning that patients are sick at discharge raises questions about the effectiveness of the hospital stay, notably among Nguyen et al.'s study cohort, which consisted of 32,835 hospitalized patients with a mean relatively young age of 61 years and an overall median length of stay of 4 days. Closer examination of these hospitalized patients shows that, within the prior 12 months, more than one in four had visited the emergency department (ED), and nearly one in three had been hospitalized. One in five had a Charlson comorbidity index score of 2+, indicating substantial comorbidity. These characteristics suggest that this hospitalized cohort, or at least a subset, had a heavy burden of preexisting chronic conditions. While hospitals are designed to treat patients, and particularly the illness that prompted the hospital stay, hospital stays—especially on medical wards—most often serve to diagnose and stabilize, rather than cure, patients of their disease.

Curative, disease-controlling, or symptom-management treatment plans may be developed or implemented in either the ambulatory or hospital setting or across these settings. Most often, treatment for the reason for admission continues long after an acute care hospital stay. Using this framework, the 19 % prevalence of instability at discharge found by Nguyen et al. is not surprising. Most hospitalized patients were sick before hospitalization, and much of their sickness could not be cured, at least not with a 4-day hospital stay.

That 14 % of the hospitalized patients in Nguyen's study were readmitted or died within 30 days after hospital discharge highlights the importance of the preexisting and ongoing disease trajectories for hospitalized patients. Among this 14 % of hospitalized patients, 36 % had had an ED visit and 46 % had had a hospital stay within the previous year, suggesting their illness required substantial assistance beyond family support or clinic visits. While we know little about the social status of this cohort, we are told that only 36 % are married, suggesting that many may not have had a structured home support system to which they could return after discharge.

Using instability at discharge as a diagnostic test for predicting post-discharge adverse events meets many standard criteria for a feasible, reliable, and valid signal of patient risk for adverse events. Data about vital signs are clinically simple, available routinely and periodically, usually reliably measured within and between observers, and reproducible across diverse patient cohorts and clinical venues. Furthermore, the authors highlight the importance of the dose-dependent relationship between the number of vital sign abnormalities at discharge and the odds of post-discharge adverse events. The adjusted odds for death was 2.12 among those with one instability, 3.26 among those with two, and 3.80 among those with three or more instabilities at discharge, even though hospice patients were excluded from the analysis. A similar but not quite as strong pattern is noted for readmissions.

IS MEASURING INSTABILITY AT DISCHARGE ENOUGH?

Nguyen et al. show the predictive power of using instability at discharge across a diverse set of patients and hospitals. Despite this important contribution, future research agendas should address the issue of *why* vital signs remain abnormal at discharge. Is the instability a measure of ongoing chronic illness, of new or worsening illness during the hospital stay, or of poor

quality of care? Does the fast heart rate or low oxygen value reflect treatable or untreatable disease? If the disease is treatable, is there evidence that the hospital is the best venue for this treatment?

While there is value in assessing risk for post-discharge adverse events at the time of hospital discharge planning, an even better strategy might be to begin at admission (or when feasible in the ambulatory setting during regular preventive care visits) and to identify the opportunities and challenges for addressing these conditions. When a condition is not treatable, strategies for improving the patient experience should be considered, and patients should be engaged in understanding the nature of their conditions, prognosis, and treatment options. The hospital's multidisciplinary resources could contribute to a plan for addressing key clinical challenges. Proactive planning, beginning at admission, would avoid last-minute surprises regarding viable post-discharge supports for patients.

SHIFTING THE FOCUS FROM DISCHARGE PLANNING TO RECOGNITION OF PERSONAL, PUBLIC, AND COMMUNITY OPPORTUNITIES

Hospital stays provide important opportunities for understanding both fiscal and social resources patients may or may not have had prior to admission, and those that the patient may or may not have post-discharge—information that is critical to ensuring continuity and coordination of patient care across multiple care settings. A hospital stay offers an occasion to gather data about the patient's post-discharge healthcare resources, including family and friends, and private and public resources. The hospital stay can also provide an opportunity for important discussions about the patient's prognosis. Information about patient values and resources can facilitate a smooth transition between inpatient and post-discharge care, and can provide a foundation for a more coordinated approach to care in post-discharge ambulatory, in-home, or post-acute care settings.

Such a viewpoint has been emphasized since the implementation of the US Centers for Medicare & Medicaid Services Readmissions Reduction Program.⁵ With limited data showing that poor hospital care is responsible for hospital readmissions, the emphasis has been shifting toward understanding the hospital role in a community context.^{6–8} Furthermore, recent recognition of the importance of community attributes as a key predictor of death and readmission (after considering income levels⁹) speaks to the importance of both income and community resources as critical components of assessing post-discharge risk and opportunity.¹⁰

Beyond instabilities at discharge (often largely predicted by instabilities at admission), Nguyen et al. show that a serum albumin less than 2 g/dl was the strongest predictor of death and readmission, and having Medicaid insurance was the strongest predictor of readmission. Understanding the predictive value of an abnormal laboratory test and reasons a patient has Medicaid—but not other insurance—are likely to be as important

in preventing post-discharge adverse events as is assessing a patient's abnormal vital signs. Having metrics like vital sign instability—whether at admission, discharge, or in the ambulatory setting—is important as a predictor of adverse events. Recognition of these findings presents an important opportunity during the hospital stay and beyond to understand reasons for these vital but unstable metrics, how they relate to other factors (e.g., low albumin, health insurance for indigent patients, or social determinants of health), and how personal, private, public, and community resources can be used to mitigate risks.

The authors suggest that instability at discharge might contribute to the assessment of the safety and appropriateness of discharge. This is an important consideration, as options include extending the hospital stay, transferring the patient to a post-discharge facility with a higher level of care than their pre-discharge status, or sending the patient back home. While the presence of instability at discharge can predict post-discharge adverse events, the presence of abnormalities in vital signs often reflects problems that will require a coordinated, continuous, and comprehensive plan involving multiple stakeholders. The discharging physician can have an important role, as can the accepting post-discharge home care nurse, post-acute care venue, and continuity provider or team. With evidence accumulating that income and community resources are critical assets for mediating the success of the health care delivery system, as well as the success of personal and population health, we should consider the applicability of these factors toward abnormal vital signs before, during, and after the hospital stay.

While the presence of unstable vital signs at hospital discharge remains an important risk for post-discharge adverse events, we now know that addressing the causes of vital sign abnormalities and implementing meaningful strategies to address them requires consideration of more than another hospital day or a post-discharge hospital visit. Clinicians, researchers, policymakers, and communities have an opportunity to consider how personal, community, and public resources can consider both patient values and risk in an ongoing manner before, during, and after the hospital stay.

Corresponding Author: Katherine L. Kahn, MD; Division of General Internal Medicine and Health Services Research, David Geffen School of Medicine at University of California, 911 Broxton Plaza, Los Angeles, CA 90024, USA (e-mail: kkahn@mednet.ucla.edu).

Compliance with Ethical Standards:

Conflict of Interest: Dr. Kahn has no conflict of interest to report.

REFERENCES

1. Nguyen OK, Makam AN, Clark C, et al. Vital Signs are Still Vital: Instability on Discharge and the Risk of Post-Discharge Adverse Outcomes. *J Gen Intern Med*. doi:10.1007/s11606-016-3826-8.
2. Kahn KL, Keeler EB, Sherwood MJ, et al. Comparing outcomes of care before and after implement of the DRG-based prospective payment system. *JAMA*. 1990;264(15):1984–1988.

3. **Kosecoff J, Kahn KL, Rogers WH, et al.** Prospective payment system and impairment at discharge. The 'quicker and sicker' story revisited. *JAMA*. 1990;264(15):1980-1983.
4. **Halm EA, Fine MJ, Kapoor WN, Singer DE, Marrie TJ, Siu AL.** Instability on hospital discharge and the risk of adverse outcomes in patients with pneumonia. *Archives of internal medicine*. 2002;162(11):1278-1284.
5. US Centers for Medicare & Medicaid Services Readmissions Reduction Program. <https://www.cms.gov/medicare/medicare-fee-for-service-payment/acuteinpatientpps/reasmision-reduction-program.html>. Accessed xx, 2016.
6. **McCarthy D, Johnson MB, Audet A-M.** Recasting Readmissions by Placing the Hospital Role in Community Context. *JAMA*, January 23/30, 2013-Vol 309, No.4.
7. **Joynt KE, Jha AK.** Thirty-Day Readmissions-Truth and Consequences. *N Engl J Med* 366:15, April 12, 2012.
8. **Joynt KE.** The ninety-nine percent: focusing on the patient to reduce readmissions. *J Gen Intern Med* 29(4):556-7.
9. **Chetty R, Abraham S, et al.** The association between income and life expectancy in the United States, 2001-2014. *JAMA*. doi:10.1001/jama.2016.4226.
10. **McGinnis JM.** Income, life expectancy, and community health: underscoring the opportunity. *JAMA*. 2016;315:16.