Published in final edited form as:

J Hosp Med. 2015 February ; 10(2): 135–136. doi:10.1002/jhm.2309.

Risk after hospitalization: We have a lot to learn

Kumar Dharmarajan, MD, MBA and Harlan M. Krumholz, MD, SM

Section of Cardiovascular Medicine (KD, HMK), Department of Internal Medicine, Yale University School of Medicine, New Haven, CT; Center for Outcomes Research and Evaluation (KD, HMK), Yale-New Haven Hospital, New Haven, CT; Robert Wood Johnson Foundation Clinical Scholars Program (HMK), Department of Internal Medicine, Yale University School of Medicine, New Haven, CT; Department of Health Policy and Management (HMK), School of Public Health, Yale University, New Haven, CT

Keywords

post-hospital risk; readmissions; continuity of care transition and discharge planning

The immediate period after hospital discharge is dangerous. Patients' health, often marginal at best, frequently deteriorates, sending them to the emergency department,¹ back to the hospital in-patient service,² or into a period of functional decline.^{3,4} Among older patients hospitalized with heart failure, for example, death is even more common in the month following discharge than during the initial hospital stay.^{5,6} Vulnerabilities in this period are many, and patients are susceptible to deterioration in health from a broad spectrum of conditions, not just the initial illness that triggered hospitalization.⁷ This period has been labeled post-hospital syndrome, as it appears that patients have an acquired, transient period of generalized risk to a wide range of medical problems.⁸ As recognition of these risks has increased, the goal of improved short-term outcomes after hospitalization has become a focus for providers, payers, and policymakers.⁹

In this issue of the *Journal*, McAlister and colleagues ask whether short-term vulnerability after hospitalization is related to weekend versus weekday discharge. After examining almost 8,000 patients discharged from the general medical wards of 7 teaching hospitals in Alberta, Canada, the authors found that only 1 in 7 were discharged on weekends, defined as Saturday or Sunday. Patients discharged on the weekend were younger, had fewer chronic health conditions, and shorter average lengths of stay. In analyses adjusted for patient demographics and a measure of short-term risk after hospitalization (LACE score), weekend discharge was not associated with higher rates of unplanned readmission or death at 30 days.

Corresponding author: Harlan M. Krumholz, 1 Church Street, Suite 200, New Haven, CT 06510; (t) 203-764-5885; (f) 203-764-5653; harlan.krumholz@yale.edu.

Disclosures: Drs. Dharmarajan and Krumholz work under contract with the Centers for Medicare & Medicaid Services to develop and maintain performance measures. Dr. Krumholz is the chair of a cardiac scientific advisory board for UnitedHealth and is the recipient of research grants from Medtronic and from Johnson & Johnson, through Yale University, to develop methods of clinical trial data sharing.

Most strikingly, only the healthiest patients were discharged on weekends. These results are similar to findings from the authors' previous work on patients hospitalized with heart failure.¹⁰ Yet the implications for discharge planning are much less clear, as the few analyses of discharge day from the authors¹⁰ and others¹¹ do not account for the range of factors that may influence risk after hospitalization such as patients' clinical characteristics, the quality of both hospital and transitional care, and the post-hospital environments to which patients are discharged. Not surprisingly, different methodologic approaches have shown weekend discharge to be associated with a range of outcomes including lower,¹¹ identical,¹² and higher¹⁰ rates of unplanned readmission and death. Moreover, the influence of discharge timing itself is likely to involve further complexities including patients' readiness for discharge,¹³ the specific days of the week on which both admission and discharge occur,¹⁴ and the outpatient resources made available to patients by specific health insurance carriers.¹⁴

These studies illustrate a fundamental issue with our efforts to reduce short-term readmission, namely, that we do not understand which factors most influence risk.¹⁵ Prediction models have generally focused on traditional markers of risk including patients' demographic characteristics, their physical examination findings, and laboratory test results. While models based on these variables are often excellent at discriminating between patients who are likely to die soon after hospitalization, their ability to identify specific patients who will be rehospitalized has been mediocre.^{16,17} This difficulty with prediction suggests that readmission has far more complex determinants than death in the short-term period after hospitalization. Unfortunately, we have yet to identify and model the factors that matter most.

Where should we look to find these additional sources of vulnerability after hospitalization? Previous research has made clear that we are unlikely to find single markers of risk that adequately predict the future. Rather, we will need to develop more complete understandings of patients including their dynamics of recovery, the role of the hospital environment in prolonging or instigating further vulnerability, the manners by which organizational context and implementation strategies impact transitional care, and the ways in which social and environmental factors hasten or retard recovery. For each of these categories, there are multiple specific questions to address. The following are illustrative examples:

Patient factors

What is the role of multiple chronic conditions in risk after discharge? Are specific clusters of chronic diseases particularly correlated with adverse health events? Moreover, how do common impairments and syndromes in older persons such as cognitive impairment, functional impairment, difficulty with walking, sleep disturbance, and frailty contribute to post-hospitalization vulnerability? Would measurements of mobility and function immediately after discharge provide additional value in risk stratification beyond such measurements made during hospitalization?

Hospital environment

How does ambient sound, ambient light, shared rooms, and frequent awakening for vital signs checks, diagnostic tests, or medication administration affect sleep duration and quality, incident delirium, and in-hospital complications? What influence do these factors have on post-discharge recovery of baseline sleep patterns and cognition? How does forced immobility from bed rest or restraints influence recovery of muscle mass and the function of arms and legs after discharge? How does fasting prior to diagnostic tests or therapeutic interventions impact recovery of weight, recovery of strength, and susceptibility to further illnesses after hospitalization?

Care transitions

What are the influences of organizational context on the success or failure of specific transitional care interventions? What is the relative importance of senior managerial commitment to improving post-discharge outcomes, the presence of local champions for quality, and an organization's culture of learning, collaboration, and belief in shared accountability? How does the particular way in which a program is implemented and managed with regard to its staffing, education of key personnel, available resources, methods for data collection, measurement of results, and approach to continuous quality improvement relate to its ability to reduce readmission?

Social and environmental factors

What particular types of emotional, informational, and instrumental supports are most critical after hospitalization to avoid subsequent adverse health events? How do financial issues contribute to difficulties with follow-up care and medication management, adherence to dietary and activity recommendations, and levels of stress and anxiety following discharge? How does the home environment mitigate or exacerbate new vulnerabilities after hospitalization?

Ultimately, an improved understanding of the breadth of factors that predict recurrent medical illness after discharge, as signaled by readmission, and the manner in which they confer risk will improve both risk prediction and efforts to mitigate vulnerability after hospitalization. Ultimately, we need to learn how to align our hospital environments, transitional care interventions, and strategies for longitudinal engagement in ways that improve patients' recovery. The work by McAlister and colleagues is a step in the right direction, as it breaks with the exclusive examination of traditional patient factors to incorporate complexities associated with discharge timing. Such investigations are necessary to truly understand the myriad sources of risk and recovery after hospital discharge.

Acknowledgments

Financial Support: Dr. Dharmarajan is supported by grant K23AG048331-01 from the National Institute on Aging and the American Federation for Aging Research through the Paul B. Beeson Career Development Award Program. Dr. Krumholz is supported by grant 1U01HL105270-05 (Center for Cardiovascular Outcomes Research at Yale University) from the National Heart, Lung, and Blood Institute. The content is solely the responsibility of the authors and does not represent the official views of the National Institute on Aging, National Heart, Lung, and Blood Institute, or American Federation for Aging Research.

References

1. Vashi AA, Fox JP, Carr BG, et al. Use of hospital-based acute care among patients recently discharged from the hospital. *JAMA*. 2013; 309:364–371. [PubMed: 23340638]
2. Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. *N Engl J Med*. 2009; 360:1418–1428. [PubMed: 19339721]
3. Gill TM, Allore HG, Holford TR, Guo Z. Hospitalization, restricted activity, and the development of disability among older persons. *JAMA*. 2004; 292:2115–2124. [PubMed: 15523072]
4. Gill TM, Allore HG, Gahbauer EA, Murphy TE. Change in disability after hospitalization or restricted activity in older persons. *JAMA*. 2010; 304:1919–1928. [PubMed: 21045098]
5. Bueno H, Ross JS, Wang Y, et al. Trends in length of stay and short-term outcomes among Medicare patients hospitalized for heart failure, 1993–2006. *JAMA*. 2010; 303:2141–2147. [PubMed: 20516414]
6. Drye EE, Normand SL, Wang Y, et al. Comparison of hospital risk-standardized mortality rates calculated by using in-hospital and 30-day models: an observational study with implications for hospital profiling. *Ann Intern Med*. 2012; 156:19–26. [PubMed: 22213491]
7. Dharmarajan K, Hsieh AF, Lin Z, et al. Diagnoses and timing of 30-day readmissions after hospitalization for heart failure, acute myocardial infarction, or pneumonia. *JAMA*. 2013; 309:355–363. [PubMed: 23340637]
8. Krumholz HM. Post-hospital syndrome--an acquired, transient condition of generalized risk. *N Engl J Med*. 2013; 368:100–102. [PubMed: 23301730]
9. Kocher RP, Adashi EY. Hospital readmissions and the Affordable Care Act: paying for coordinated quality care. *JAMA*. 2011; 306:1794–1795. [PubMed: 22028355]
10. McAlister FA, Au AG, Majumdar SR, Youngson E, Padwal RS. Postdischarge outcomes in heart failure are better for teaching hospitals and weekday discharges. *Circ Heart Fail*. 2013; 6:922–929. [PubMed: 23811962]
11. van Walraven C, Bell CM. Risk of death or readmission among people discharged from hospital on Fridays. *CMAJ*. 2002; 166:1672–1673. [PubMed: 12126321]
12. McAlister, et al. Post-discharge outcomes are similar for weekend versus weekday discharges for general internal medicine patients admitted to teaching hospitals. *J Hosp Med*. 2014 xx:xxx-xxx.
13. Capelastegui A, Espana Yandiola PP, Quintana JM, et al. Predictors of short-term rehospitalization following discharge of patients hospitalized with community-acquired pneumonia. *Chest*. 2009; 136:1079–1085. [PubMed: 19395580]
14. Bartel, AP.; Chan, CW.; Kim, S-H. Should hospitals keep their patients longer? The role of inpatient and outpatient care in reducing readmissions. NBER working paper no. 20499. Cambridge, MA: National Bureau of Economic Research; 2014 Sep.
15. Kansagara D, Englander H, Salanitro A, et al. Risk prediction models for hospital readmission: a systematic review. *JAMA*. 2011; 306:1688–1698. [PubMed: 22009101]
16. Dharmarajan K, Krumholz HM. Strategies to reduce 30-day readmissions in older patients hospitalized with heart failure and acute myocardial infarction. *Curr Geri Rep*. 2014; 3:306–315.
17. Hersh AM, Masoudi FA, Allen LA. Postdischarge environment following heart failure hospitalization: expanding the view of hospital readmission. *J Am Heart Assoc*. 2013; 2:e000116. [PubMed: 23580604]