



The effect of workforce assignment on performance: Evidence from home health care[☆]

Guy David^{a,*}, Kunhee Lucy Kim^b

^a The Wharton School, University of Pennsylvania, Philadelphia, PA 19104, USA

^b New York University School of Medicine, New York, NY 10016, USA

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ABSTRACT

Effective workforce assignment has the potential for improving performance. Using novel home health data combining provider work logs, personnel data, and detailed patient records, we estimate the effect of provider handoffs—a marker of care discontinuity—on hospital readmissions, an important performance measure for healthcare systems. We use workflow interruption caused by attrition and providers' work inactivity as an instrument for nurse handoffs. We find handoffs to substantially increase hospital readmissions. Our estimates imply that a single handoff increases the likelihood of 30-day hospital readmission by 16 percent and one in four hospitalizations during home health care would be avoided if handoffs were eliminated. Moreover, handoffs are more detrimental for high-severity patients and expedite hospital readmission. The frequency and sequencing of handoffs also affect the likelihood of rehospitalization.

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1. Introduction

Workforce allocation and scheduling are routinely designed to achieve multiple organizational goals, with efficiency typically viewed as the leading objective. Efficient workforce assignment entails the matching of task and talent (Garicano and Santos, 2004), management of planned and unplanned absences (Ehrenberg, 1970; Allen, 1983), exigency and geographical optimization, and responsiveness to demand shocks (Hamermesh and Pfann, 1996). Beyond efficiency, workforce allocation goals may include rewarding seniority, promoting workforce equity, and enabling effective learning and synergy (Mas and Moretti, 2009). These goals potentially compromise short-term efficiency but at the same time raise employee satisfaction and reduce costly turnover. Another set of objectives is linked with the use of workforce assignment to achieve higher quality. While often in conflict with cost minimization goals, higher quality may be rewarded directly through higher willingness to pay and indirectly through increased reputation.

Hospitals and health care systems implement strategies to improve the quality of care for all patients through focusing on

patient safety, reducing medical errors, establishing evidence-based guidelines, and lowering the rate of unnecessary and preventable intervention (Kozak et al., 2001; Makary and Daniel, 2016). In fact, ensuring continuity of care within and across care settings is identified as a pillar of quality improvement (Richardson et al., 2001).¹ Continuity of care across settings involves, by definition, a multi-professional pathway that emphasizes the need for care coordination. On the other hand, continuity of care within a setting is achieved by workforce allocation, and in particular a continuous relationship between a patient and a single health care professional who is the sole source of care and information for the patient.

However, the achievement of continuity of care requires costly deployment of resources. Ensuring smooth transitions in care and effective transmission of information between providers likely imposes massive constraints that interfere with the goal of optimizing scheduling to minimize workforce turnover and contractual disruptions. Thus, efficient workforce assignment may lead to reductions in quality of care through compromised care continuity. Using a novel data set from a large multi-state freestanding home health agency, this paper quantifies the effect of within-setting care discontinuity caused by workforce assignment on hospital readmissions, a common quality of care marker.

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* Corresponding author.

¹ Continuity of care has also been shown to reduce utilization and costs of care (Raddish et al., 1999), such as by reducing the number of emergency department visits and shortening the length of hospital stays (Wasson et al., 1984).

Spending due to unplanned hospital readmissions was estimated at \$17.4–\$25 billion annually, which would translate to 16–22% of the total Medicare spending on inpatient hospital services (Pricewaterhouse Coopers' Health Research Institute, 2008; Jencks et al., 2009). The national all-cause potentially preventable readmission rates for this population was 11% in 2014 (MedPAC, 2016a). Starting in October 2012, the Center for Medicare and Medicaid Services (CMS) lowered its payment to hospitals with excess readmissions over the national average by up to 3%.² Facing financial penalties, hospitals use management strategies and modifications to their organizational structure to prevent hospital readmissions. For example, hospitals vertically integrated with post-acute care providers such as home health agencies (HHAs) to improve post-discharge care coordination, as increased reliance on home health has been shown to be associated with a reduction in hospital readmissions (Polsky et al., 2014).³ Moreover, hospitals rely on post-acute care entities to reduce avoidable readmissions (Naylor et al., 2012). Once patients are discharged from hospitals, post-acute care providers monitor and treat still frail patients over an extended period of time.⁴ Thus, post-acute care providers can impact the frequency of hospital readmissions by implementing workforce assignment strategies that promote care continuity.

We focus on home health care as it is an important and rapidly growing segment of the health care delivery system. Over the past decade, payment for home health services more than doubled (MedPAC, 2016b). This rapid growth may be attributed to its appeal to patients who prefer to recover at home, providers who prefer to shorten hospitalization lengths, and insurers who benefit from cheaper care at home than care in brick-and-mortar institutions. Home health care is recognized as a partial substitute for institutional long-term care (Guo et al., 2015). The importance of home health care has also increased with the rise of enhanced care coordination and shared savings models such as Accountable Care Organizations or Bundled Payments for Care Improvement (Sood et al., 2011).

Studying the intricacies of home health care provision and its impact on hospital readmissions is timely and important. Before the ACA, there was no competitive pressure for HHAs and no financial incentives to reduce readmissions, with three in ten post-acute home health stays resulting in a hospital readmission among Medicare patients (MedPAC, 2014).⁵ However, with readmission penalties and the emphasis on population health management, home health has become a way to allow for continuity of care outside of the hospital and effectively manage the patient health to prevent unnecessary readmissions. Freestanding agencies often view the ability to mitigate hospital readmission as a key competitive differentiator in contracting with hospitals (Worth, 2014). Therefore, it is important to uncover potential mechanisms that lead to better care continuity and patient outcomes.

² The amount of reduction in payment was up to 1 percent in FY 2013, the first year of the penalty (so-called the Hospital Readmissions Reduction Program), and up to 2 percent in FY 2014.

³ Naylor et al. (1999) discuss hospitals that instituted programs to provide patient education before discharge, increased patient follow-up, and expanded the use of health information technology to track readmissions and integrate care across settings; Kim et al. (2015) show that admitting ER patients to the Intensive Care Units could substantially reduce hospital readmissions, and therefore suggest implementing admission criteria based on objective measures of patient risk as well as physicians' discretionary information as a promising way to decrease hospital readmissions.

⁴ In the case of home health care, the default length of an episode is 60 days for Medicare patients.

⁵ This figure could also be attributed to the fact that patients being discharged to home health care tend to be sicker and at a higher risk of hospital readmissions than those being discharged to home.

In this paper, we use novel data containing over 43,000 home health patient episodes and spanning 89 autonomously run home health offices in 16 states. The data provide detailed information, which includes visit logs for all Medicare patients, work logs and human resources data for all home health providers, as well as all patient demographic and health risks collected as part of the Outcome and Assessment Information Set (OASIS) required by the CMS. In addition, our data are linked with individual patients' hospital readmissions. We measure care discontinuity by handoffs between skilled nurses over a patient's episode of care, which are immediately affected by offices' workforce allocation decisions.⁶ We estimate a plausibly causal effect of provider handoffs on hospital readmissions using day-to-day human resources data on providers' absence, assignment to an alternative office, and job termination to instrument for handoffs. Unplanned employee absences in the US health care and social assistance sector consumed 1.9% of all scheduled work hours in 2016 (Bureau of Labor Statistics, 2017). To uncover the mechanisms underlying the effect of handoffs, we also examine whether handoffs affect hospital readmissions differently by underlying patient severity and by the frequency and sequencing of handoffs, respectively, and whether handoffs affect time to readmission.

Estimating the effect of handoffs in home health care on the probability of readmissions raises endogeneity concerns. While we observe a great deal of patient characteristics as well as labor supply conditions, the data do not provide us with the actual care plan for each patient's episode of care. The care plan is plausibly linked to unobserved patient severity and hence to the risk of hospital readmissions. As we discuss in the paper, it is challenging to determine the sign of the omitted variable bias caused by unobserved patient characteristics. To address this endogeneity problem, we use detailed provider-day level data on nurses' availability to instrument for both handoffs and the probability of receiving a visit. The identification assumption is that skilled nurses' absence affects rehospitalization only through its effect on care discontinuity either through missed visits or handoffs. In addition, and as explained in greater detail in our methods section, we control for the dynamic changes in patients' health status during a home health episode by limiting the variation in our data to reflect the number of days since the last nurse visit as well as supply and demand characteristics at the nurse- and office-day level. Together with the patient's initial health assessment, these controls help mitigating potential confounding effects.

Using the cross-sectional variation, we find that patients experiencing nurse handoffs are 24% more likely to be readmitted to a hospital. This estimate more than doubles in magnitude when we use the instrumental variables (IV) method. Our results are robust to controlling for days since last visit as well as a rich set of patients' health risk, demographic, and comorbidity factors, office fixed effects, time fixed effects, and home health day fixed effects. Controlling for home health day fixed effects is especially important because the probabilities of hospital readmissions and handoffs rapidly decline over the course of a home health episode. Furthermore, in our analysis of potential mechanisms, we find that handoffs are more detrimental for high-severity patients and expedite hospital readmission. The frequency and sequencing of handoffs also affect the likelihood of rehospitalization with the first handoffs having the strongest effect on increasing hospital readmissions.

A number of potential mechanisms may account for the effect of provider handoffs on hospital readmissions. First, information transmission between providers involved in a handoff may be

⁶ Skilled nurses refer to registered nurses (RNs) or licensed practical nurses (LPNs).

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