Do Hospital Closures Improve the Efficiency and Quality of Other Hospitals?

1. Introduction

The number of US hospital closures has been increasing in the past decade, as hospitals continue to face multiple challenges from declining patient volumes, tighter reimbursement from purchasers, increased competition, and growing expectations on quality (Lindrooth et al., 2018). Because many US hospitals have been operating at suboptimal efficiency, demonstrated by the lowest average bed occupancy rate of 65-67% among all industrialized countries (OECD, 2009), closing of inefficient hospitals and pooling patient demands to the remaining ones have potential to improve the overall operational efficiency of the health care system. Yet, the effect of hospitals closures on the efficiency and quality of care has remained largely unknown.

From an operations management perspective, pooling of customer demands and resources can improve the operational efficiency of the organization (Cattaini et al., 2015; van Dijk et al., 2008). When there is an exogeneous increase in patient volume due to closures of surrounding hospitals, the remaining hospital can improve its throughput (i.e., the number of patients treated per unit time) through three mechanisms: (1) by increasing the number of beds and staff, (2) by increasing bed occupancy, or (3) by reducing patient length of stay (LOS) (Litvak et al., 2011). Because an increase in bed utilization may be correlated with a decrease in LOS due to resource constraints or provider behavior changes (Song et al., 2015), the net effect of closures on efficiency is not clear, and needs a careful investigation. Implications of closures on quality is also unpredictable because higher bed occupancy will inevitably increase the expected waiting time, and providers may also respond by changing patient LOS and/or quality (Weissman et al., 2007; Chan et al., 2016).

We study the impact of hospital closures on the surrounding hospitals’ efficiency and the mechanisms through which the changes occur. We also investigate the implications of hospital
closures on quality. We do these by examining the throughput, bed utilization, length of stay, readmissions, and mortality using a nationally representative panel data of Medicare patients. We find that closure of a hospital results in improvement in throughput and bed utilization at nearby hospitals, and this happens without reducing the patients’ LOS. Furthermore, although hospital closures do not affect readmission and 30-day mortality rates of their surrounding hospitals, we find signs of long-term negative consequences on quality such as an increase in one-year mortality.

2. Methodology and Data

Our primary data is Medicare Cost Reports and 20% random sample of traditional fee-for-service Medicare claims for inpatient visits between 2006 and 2012. Our study population includes Medicare beneficiaries who visited short-term acute care hospitals during the study period. Hospitals and the patients in the markets with hospital closures were compared to those in the markets without any closures. Hospital closures were identified from Medicare inpatient claims and Medicare cost reports, and verified through various sources. During the study period, we identified a total of 114 hospitals closures over 87 hospital referral regions. We measured hospitals’ operational efficiency as (a) throughput (total number of patient claims per bed per year), (b) utilization, (the total inpatient days per bed per year), and (c) length of stay (average days of inpatient stay). Quality of care was measured through (a) readmission (presence of another hospitalization within 30 days after discharge), and (b) 30-day and one-year all-cause mortality. Our main empirical strategy is difference-in-differences analysis of linear model conducted at the hospital and patient level. The statistical model includes the time and area fixed effects, patient level demographic, socioeconomic, and clinical variables, hospital level characteristics (e.g., geography, teaching status, ownership status, and quality), and the area level
resources. We tested the robustness of our results by examining the exogeneity of hospital closures, conducting matching by hospitals and markets, testing the parallel trend assumption by examining the pre-closure trends, and using alternative model specifications and variables.

3. Key Results and Main Contributions

We find that hospitals nearby a closing hospital do not change their resource levels measured as beds and employees, but increase both throughput and bed utilization. We did not find statistically significant changes in LOS. Thus, our results show that the improvement in efficiency comes from the greater use of the available beds, whereas the duration of care remains intact. Furthermore, efficiency improvement was not associated with increase in readmission rate or 30-day mortality. However, one-year mortality increased at a statistically significant level after closure. Put together, our results suggest that although there is no measurable immediate consequence on quality after closure, the changes have long-term negative consequences. Our results make an important contribution to the health care operations management literature by providing empirical evidence that increase in patient demand through pooling of resources can induce providers to improve efficiency through higher utilization without reduction in service time. It also provides evidence of unintended long-term consequences of efficiency improvement on quality through increase in mortality.

References