



Average surgeon-level volume and hospital performance



Gregory N. Stock^{a,*}, Christopher McDermott^b, Gopesh Anand^c

^a College of Business, University of Colorado Colorado Springs, United States

^b Lally School of Management, Rensselaer Polytechnic Institute, United States

^c Department of Business Administration, College of Business, University of Illinois at Urbana-Champaign, United States

ARTICLE INFO

Article history:

Received 15 February 2016

Received in revised form

3 August 2016

Accepted 19 August 2016

Available online 8 September 2016

Keywords:

Average surgical volume

Length of stay

Cost

Mortality

Hospital

Health care

ABSTRACT

This study evaluates the relationships among the average number of procedures per surgeon, calculated across the entire hospital, and multiple dimensions of overall hospital operational performance. Hospital administrative data from 154 public and private hospitals in the state of New York were augmented by data from the Centers for Medicare and Medicaid Services. The data included administrative surgical records across all clinical areas for the year 2009. The study used maximum likelihood estimation path analysis to simultaneously test the relationships among average surgical volume and risk-adjusted length of stay, cost, and mortality, across all surgical procedures and clinical areas. The results showed that higher average volume per surgeon, computed across all surgical procedures in a hospital, was directly related to lower risk-adjusted length of stay, and indirectly related to lower risk-adjusted cost and mortality. A higher average number of procedures per surgeon may provide greater hospital-specific experience, including interactions among surgical teams and with other areas of the hospital, leading to better overall outcomes. This study advances the literature in health care operations management by examining the relationships among surgical volume, across all clinical areas and all types of surgeries, and three different dimensions of hospital performance.

© 2016 Elsevier B.V. All rights reserved.

1. Introduction

Health care spending comprised 17.9% of the United States Gross Domestic Product in 2012 (World Bank, 2014). However, the quality of health care in the United States is only ranked as “fair” by the Agency for Healthcare Research and Quality (Agency for Healthcare Research and Quality, 2014). An analysis by the Commonwealth Fund ranked the quality of health care in the United States fifth among eleven developed countries in 2011, despite per capita health care spending of \$8508. That level of spending was 50% greater than that of the second highest spending country (Norway), and more than twice the per capita spending level of the country ranked first in quality (United Kingdom) (Commonwealth Fund, 2014). While there is not universal agreement on the validity of health care quality country rankings or assessments, it is clear that the much greater level of costs incurred to deliver health care in the United States has not provided correspondingly higher levels of quality. Therefore, identifying factors that are related to better cost performance or quality performance, or better yet, both, is worthwhile.

One possible such factor is the relationship between surgical volume and health care outcomes. For the most part, the large body of research in this area has found a positive relationship between volume and outcomes (Luft et al., 1987; Regenbogen et al., 2012). At the same time, a significant portion of the research has failed to find such a relationship (Halm et al., 2002; Khuri and Henderson, 2005; Gruen et al., 2009). These studies have generally considered total surgical volume in a particular clinical area for an entire hospital or the total surgical volume for an individual surgeon for a specific type of surgery. However, a surgical procedure is comprised of a set of activities spanning the individual surgeon, the surgical team, and the hospital organization. The success or failure of a surgical procedure depends on the technical and interpersonal skills of the surgeon and the surgical team, as well as the support and resources of the hospital in which the surgery is performed. Therefore, it is important to think about surgical volume in a way that combines the perspectives of both the overall hospital organization and the individual surgeon.

In addition, a particular service line such as cardiovascular surgery might be viewed as more profitable and, as such, an organization might deliberately aim to expand volumes in that area. This hospital might also disproportionately (compared to their other service lines) invest in equipment or resources to generate this volume and thus position themselves as a leader in that area. Therefore, studying outcomes in only this single service line might

* Correspondence to: University of Colorado Colorado Springs, College of Business, 1420 Austin Bluffs Parkway, Colorado Springs, CO 80907, USA.

E-mail addresses: gstock@uccs.edu (G.N. Stock),

mcderc@rpi.edu (C. McDermott), gopesh@illinois.edu (G. Anand).

capture not only the effects of increased volume, but also the effects of these disproportionate investments. Moreover, the funds targeted for such investments must come from somewhere else within the organization, which would likely reduce funding for other service lines. In our example, cardiovascular surgery outcomes might be improved, but performance in other surgical specialties might actually suffer as resources are diverted to the targeted clinical area (cardiovascular surgery) and away from other service lines.

To address the two issues above, this study examines the volume-outcomes relationship by conceptualizing surgical volume as the average number of procedures per surgeon across all types of surgeries in the hospital. Surgical volume seen in this way reflects the volume per surgeon, but by aggregating all types of procedures, also provides an overall picture of how the level of accumulation of surgeries for individual surgeons across the entire hospital may affect overall hospital performance. It is particularly important to note that this conceptualization of volume as average procedures per surgeon is a hospital-level factor.

Our focus is on the average surgeon-level volume for all surgeries across the hospital, and our analysis controls for total hospital surgical volume. Further, by simultaneously studying the impacts of average surgeon-level volume on length of stay, mortality, and cost, we examine the potential of trading off efficiency and cost with quality. The mediating role that length of stay plays in the effects of average surgeon-level volume on cost and mortality is also examined. In brief, our expectations are that higher average surgeon-level volume will be related to (1) lower length of stay, (2) reduced mortality, directly, as well as (3) through reduced length of stay, and (4) reduced cost through reduced length of stay. In the next section, we develop conceptual arguments while placing our research within extant literature, based on which, hypotheses are presented in the subsequent section. We then describe the research methods and report the results of the analysis. The paper concludes with a discussion of the results and implications for research and practice.

2. Literature

2.1. Volume-outcome relationships

A greater number of iterations of an activity at the organizational level is known to provide learning curve benefits (Argote and Darr, 2000). Repetition over higher volumes helps to reveal improved ways of using technology and better ways to sequence work-tasks that are then embedded in the routines of the organization (Epplé et al., 1996). Furthermore, error correction opportunities provided by numerous trials represented by higher volumes result in deliberate improvements in work routines, making them more effective (Rerup and Feldman, 2011). Economies of scale also play a role in organizational learning as higher volumes allow for the purchase of more sophisticated and even specialized equipment as well as higher levels of training and more specialization of personnel (Flood et al., 1994; Fichman and Kemerer, 1997).

In the context of health care, numerous empirical studies have addressed the questions of hospital and surgeon volume on outcomes (e.g., Luft et al., 1987; Chowdhury et al., 2007). However, these existing studies have mainly focused on separately examining specific surgeries, such as cardiac (Pisano et al., 2001; KC and Staats, 2012) cardiovascular (Birkmeyer et al., 2003) and colorectal (Harmon et al., 1999) procedures. As noted above, examining a single type of procedure in isolation in this manner may not allow generalization of results to other types of procedures as some individual procedures may receive higher funding levels,

emphasis, or stature within the organization. Results from observations in any one area alone may stem from something other than just increased volume in that area. The disproportionate emphasis and investments in one service line might enable better performance in that line, but at the expense of others in the organization.

Indeed, although prior research has generally shown that higher volume is related to better outcomes, the results are far from universal in their support for this relationship (Halm et al., 2002; Khuri and Henderson, 2005; Gruen et al., 2009). Such inconsistency might be caused by the choice of individual procedure to study. In addition, by examining only a single procedure, it is not possible to see the effects of higher volume on overall hospital performance across all clinical areas. Increased volume in one area might be associated with improved performance in the area of study but actually hurt performance in de-emphasized areas.

Therefore, this study focuses on how average volume per surgeon is related to overall outcomes at the *hospital* level, for all surgical procedures across *all* clinical areas. By including *all* surgeries and *all* surgeons in a hospital in the analysis, this study overcomes the lack of generalizability that was a possible limitation of prior studies that considered one type of surgery in isolation.

2.2. Individual and organizational level volume

Individual surgeon volume has been shown to drive hospital-level volume effects (Birkmeyer, et al., 2003). As in the case of hospital volume studies, most of the existing research has focused on specific specialties and the effects of individual surgeon volume in these specialties (Birkmeyer et al., 2003; Mehta et al., Forthcoming). Related to the main motivation for this study, it is important to note that previous research has supported the idea that a surgeon's case volume across different hospitals does not affect patient outcomes achieved by that surgeon at any one hospital (Huckman and Pisano, 2006). This suggests that there may be hospital- and team-specific factors beyond individual procedural competence that are enhanced by higher per-surgeon patient volume.

Patient outcomes are related to success rates of procedures conducted by surgeons, but are also affected by the larger setting of perioperative care (Collins et al., 1999). The overall system matters as well, as the exchange of information among personnel plays a significant role in surgeries, and working together more often improves such exchange (Flood, 1994; Edmondson et al., 2003; Reagans et al., 2005; Vashdi et al., 2013). Especially given the dynamic nature of surgeries, improving coordination and shared understanding among perioperative care teams result in better outcomes for patients (Davenport et al., 2007; Leach et al., 2011). These factors supplement the learning from recent volume effects of high per-surgeon patient volume that are believed to result in better mortality and length of stay outcomes for patients (Luft et al., 1987).

Higher volume enables the justification of more stable teams, which have been shown to be associated with improved outcomes in the context of software development (Huckman et al., 2009; Huckman and Staats, 2011). In surgeries, in addition to team stability, higher volume also can help justify and establish common core practices and care paths. For example, consistent post-surgery reviews have been shown to help improve outcomes (Vashdi et al., 2013) and might only be viewed as justifiable once a volume threshold with a particular surgeon has been achieved.

We consider the average number of cases per surgeon *across all specialties* within each hospital to study the effects of this ratio on patient outcomes. In so doing, this study examines the hospital-specific factors that are affected by surgeons repeatedly

Download English Version:

<https://daneshyari.com/en/article/5079220>

Download Persian Version:

<https://daneshyari.com/article/5079220>

[Daneshyari.com](https://daneshyari.com)