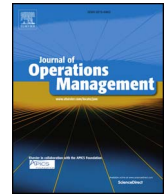




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Impact of competition on process of care and resource investments

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ABSTRACT

Although competition is generally believed to improve quality, its impact on the Process of Care (PoC)—which measures the timeliness and effectiveness of care—is less clear. Moreover, hospital executives in more competitive hospital markets are faced with several competing priorities. Our study seeks to examine two factors within this context: (1) how competition directly impacts PoC, and (2) in a financially constrained environment, how competition affects investments in resources such as nurses and technology that can potentially improve PoC. We collect longitudinal data from all acute care hospitals in California over a 7-year period from 2007 to 2013, along with data from several other sources. Analysis using a mixed-methods approach reveals that both PoC and investments in nurses and technology are lower in more competitive markets. Because future reimbursements under the pay-for-performance system will depend on the value of care provided, our results suggest that hospitals should reconsider their short-term actions that seek to increase market share and instead adopt a long-term view in which investments are made to fundamentally improve the underlying processes and PoC. The findings presented here thus have major implications for managing hospitals in competitive environments.

1. Introduction

The U.S. healthcare system has evolved over time from a fee-for-service system, which traditionally focused on paying providers based on the volume and complexity of services rendered, to a prospective payment system, which encouraged a reduction in excessive and unnecessary care by providing a fixed payment for services rendered (James, 2012), to the most recent pay-for-performance (P4P) system, which encourages the delivery of efficient and high-quality medical care. These transitions, however, have forced hospitals to become price-takers instead of price-setters and have reduced reimbursements for a majority of hospitals (Werner, 2010; Shen, 2003). They have also put greater constraints on hospitals' financial resources due to slower revenue growth and a decline in profits (Bazzoli et al., 2008). In an attempt to gain market share and reduce their local competition, one of the key mechanisms that hospitals have used in the past to cope with such changes has been to consolidate through mergers and acquisitions (Cutler and Morton, 2013). However, the Federal Trade Commission—the regulatory body overseeing business practices and consumer protection in the U.S.—has been challenging and winning a number of recent attempts at consolidation in the healthcare industry by arguing that such consolidations operate without the checks and balances of a competitive marketplace (Brill, 2015; New York Times, 2014).

Competition between hospitals may be better for patients as it stimulates innovation, which in turn improves quality (Xu et al., 2015). The opposing view is that competition may force providers to focus on cost shifting, which is defined as “payments that fall short of the costs incurred by hospitals in the treatment of Medicare beneficiaries, as measured through negative hospital margins on those patients” (Robinson, 2011; pg. 1266), under the assumption that hospitals have unused bargaining power with insurers. In turn, this may end up eroding quality, increasing costs, and fostering inefficiency in the system (Porter and Teisberg, 2006). Past research in the economics literature highlights these conflicting views—that competition either increases or decreases mortality rates (see Gaynor and Town, 2011 for a comprehensive review).

Hospitals typically struggle to balance key objectives of providing effective care, i.e., the extent to which desirable outcomes are achieved as a result of correct diagnosis and treatment of the patient and gaining operational efficiency in using their resources (Harris, 1977) possibly due to limited reimbursements. This struggle is likely to be greater under competitive conditions, as hospital executives seek ways to distinguish themselves from their competitors to attract insurers, referring physicians, and patients. Hospitals may attempt to be distinctive by offering new procedures, equipment, and services (Devers et al., 2003; Cutler et al., 2004; Tay, 2003; Wright et al., 2016). These strategies may

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however not be completely aligned with the objectives of providing the best possible care to the patients. In more competitive markets, there is a greater availability of substitute hospitals to which a patient can go to or be directed to by his or her insurer, thereby rendering demand more elastic and forcing hospitals to negotiate price discounts with various insurers (Melnick and Keeler, 2007). Consequently, this puts additional pressure on hospitals' financial resources. Such competitive pressures may cause hospital executives to choose among competing priorities, and the resulting cognitive load may cause them to focus only on a limited set of priorities (Ocasio, 1997). While the healthcare operations literature has traditionally focused on the impact of various internal hospital factors on different quality outcomes (Tucker, 2007; Kc and Terwiesch, 2009; Chandrasekaran et al., 2012; Senot et al., 2015; Berry Jaeker and Tucker, 2016), less attention has been given to how competition may affect process of care. This study aims to understand the effects of competition on the process of care (PoC) provided by hospitals, which we formally define in Section 2.1. Further, we investigate how competition shapes investment decisions in two key resources—nurses and information technology—which have been known to influence PoC. Our empirical setting draws on 242 hospitals in California representing 1694 year-hospital observations from 2007 to 2013.

Our study contributes to the literature in several important ways. First, even though PoC is an important outcome measure, the literature does not discuss the impact of competition on this measure. Second, hospitals have had several years to adjust to cost pressures resulting from the changed reimbursement system, and it remains to be seen whether hospitals have been able to adjust to the new normal and focus on offering better quality arising from competition as predicted by economic theory. Third, our study seeks to understand how hospital executives in more competitive markets might behave regarding their decisions to invest in key resources that are known to have a positive impact on quality. Fourth, results from using PoC as an outcome measure might explain some of the inconsistencies found in previous studies that have used mortality as the outcome measure, as we would expect better PoC to improve mortality rates (Newby et al., 2006; Ashton et al., 1995).

The rest of the paper is structured as follows. Section 2 reviews the literature and develops hypotheses on the effect of competition on PoC as well as effects of competition on investments in nurses and technology. Section 3 discusses the data and measurement of key variables used in the study, while Section 4 provides the methodology used to test the hypotheses and results of the analysis. Section 5 discusses the conclusions, limitations, and future research.

2. Theory and hypotheses

Before we develop the hypotheses, we explain our choice of PoC as the dependent variable and our choice of resource investments in nurses and technology. We then discuss how competition in hospital markets might impact PoC and resource investments.

2.1. Choice of dependent variable

As the Center for Medicare and Medicaid Services (CMS) states, “quality measures are used to gauge how well an entity provides care to its patients. Measures are based on scientific evidence and can reflect guidelines, standards of care, or practice parameters.” These measures or protocols thus refer to the “application of efficacy-based standards of care” (Angst et al., 2012; pg. 262), which our study collectively refers to as PoC.

We choose to study PoC as our dependent variable for the following reasons. First, PoC assesses the extent to which healthcare providers adhere to processes that are scientifically proven or “evidence based” (Jha, 2006), which makes it more straightforward to assess. Second, PoC is under greater control of healthcare providers and requires a

shorter time frame for assessment than other outcome measures that may require longer time horizons to measure (Palmer, 1997; Werner et al., 2008). Third, PoC has been linked to better patient outcomes such as lower resource usage (Andritsos and Tang, 2014), lower readmissions and lower mortality (Newby et al., 2006; Ashton et al., 1995), and lower rates of infections and complications (McCabe et al., 2009; Bozic et al., 2010). Fourth, the use of PoC as our dependent variable is likely to capture tradeoffs that hospitals face in investing their constrained resources as they seek to both improve quality and increase patient demand. For example, automated molecular testing equipment may improve the sensitivity and specificity of testing for respiratory tract infections. While this improves PoC by improving the efficiency of testing and may attract more patients in a competitive market, it is expensive and could affect how hospital executives allocate funds to resources that impact other dimensions of PoC. Thus, competitive factors will affect the PoC measure if hospitals are not taking appropriate steps to improve quality. Fifth, PoC leads to higher quality of care for patients because it is also a marker for other unmeasured quality processes that improve factors including patient safety, coordination of care, and emergency responsiveness. (Werner et al., 2008). Finally, although PoC requires a good definition of the eligible patient population, it does not require extensive risk adjustment modeling that is necessary for other outcome variables such as mortality and readmissions. Risk adjustment models require extensive psychological, anatomical, and health status data that may not be captured or be readily available in a patient's medical record (Rubin et al., 2001). For these reasons, we believe that PoC is an appropriate and comprehensive dependent variable to model in our study.

2.2. Choice of resource investments

We have chosen to use investment in nurses and technology as the resources that impact PoC. We first highlight how we have measured our resource investments, because this discussion will help better explain the relationships hypothesized between these investments and PoC in later sections.

Investment in nurses is captured by the product of hours spent by registered nurses (RNs) per patient day and the hourly rate paid to RNs per hospital per year. This definition allows us to not only capture the amount of time that RNs spend with their patients to deliver quality care but also account for differences in the salaries that hospitals have to pay for this valuable resource based on the markets within which they operate.

Our measure of technology is captured via the Saidin Index, which was initially conceptualized in 1999 to measure technological change (Spetz and Baker, 1999) and has been recently used in the operations management literature (Sharma et al., 2016). Our use of this index has several benefits. First, it captures the extent to which technologies have been adopted by hospitals in any given year. Thus, a hospital's addition of technologies that are not present in other hospitals (presumably because they are advanced or more expensive) increases the value of this index. Second, this index captures the changes in technology adoption over time. Since we use longitudinal data in our study, higher index scores indicate a greater degree of investments over time. The technologies that we use to create this index (see Appendix B) come from the list of Clinical and Augmented Clinical Health Information Technology (HIT) used in recent literature (Sharma et al., 2016). This list includes technologies such as clinical decision support and computerized physician order entry, which aid in the decision-making process by effectively integrating patient information as well as providing timely and accurate information about drug type and dosage. It also includes radiology and cardiology technologies as well as various lab systems that can help with imaging and providing quick information on diagnostic tests. Investments in these technologies are likely to aid in better adherence to evidence-based guidelines and protocols, thereby resulting in improved PoC.

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