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# Does the Office of Patient Experience Matter in Improving Delivery of Care?

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This research examines the performance benefits of the Office of Patient Experience (OPX), a new administrative innovation in the health care industry. OPX is an independent structure within a hospital, having its own annual budget and full-time staff, and is responsible for improving patient experience during the hospital stay. We specifically investigate the effectiveness of OPXs in improving experiential quality (EQ), measured as the quality of interactions between hospital's caregivers and patients. In addition, we look at how the operation of these offices help hospitals manage variability during the delivery of care, which introduces additional challenges to maintaining high EQ. Specifically, we investigate the impact of variability in care delivery introduced due to two factors—patient case mix index (CMI) and resident intensity. CMI is an indicator of patient acuity and their care burden on hospitals while resident intensity is measured as a ratio of residents to beds at a hospital and is a proxy for variability introduced due to disruptions in caregiver teams due to the presence of residents who are getting trained at the hospital. Our empirical analyses involve tracking the operation of these offices across 3615 US acute care hospitals for the years 2007–2014. To account for endogeneity, we used an instrumental variable fixed effects regression model with a least absolute shrinkage and selection operator (LASSO) on the first-stage to identify and select the strongest instruments. Findings suggest that the OPX is associated with 1.95% higher EQ for each year of its operation. Furthermore, we find that an OPX is more effective in improving EQ for hospitals that deal with high CMI patients (6.5% for high vs. −0.3% for low) or high resident intensity (1.8% for high vs. 0.9% low). Moreover, we find evidence of operating efficiencies associated with OPXs, with a 1.4% reduction in operating cost for each year of its operation. Preliminary evidence also suggests that Chief Patient Experience Officers (CXOs), leaders of OPX, with medical backgrounds (i.e., MD or nursing degree) are more effective at improving EQ. Finally, we validate our findings through interviews with OPX and hospital staff at a prominent teaching hospital with an active OPX.

*Key words:* experiential quality; health care delivery; Office of Patient Experience
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## 1. Introduction

In recent years, health care delivery in the United States has witnessed several regulatory changes that have created operational challenges for hospital administrators. For instance, the U.S. Agency for Healthcare Research and Quality (AHRQ) and the Centers for Medicare and Medicaid services (CMS) rolled out the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey in 2006. HCAHPS captures a patient's experiential quality (EQ) (Chandrasekaran et al. 2012) or the quality of interaction between hospital's caregivers and patients during care delivery. In fiscal year 2013, CMS began evaluating hospital performance on EQ along with other core process of care measures to determine its reimbursement rates. EQ consists of several dimensions that include: the quality of communication with health care providers (i.e., physicians and nurses), the quality of explanation regarding procedures, the quality of response to help calls from the patients, and the quality of after treatment recovery instructions given to the patients. Hospitals with poor EQ scores can lose up to 2% of their Medicare reimbursements, which equates to a several million dollars for an average sized hospital. This decision to evaluate hospitals on EQ marks a significant shift for the sector which had traditionally been evaluated on clinical quality metrics and process of care metrics (Levinson et al. 2010).

Hospitals have struggled to improve their EQ scores (Cosgrove 2014). This is because elements of EQ such as communication with the nurses and physicians are often considered less tangible and hence difficult to improve when compared to evidenced-based process of care measures (Senot et al. 2016). Performing well on these measures therefore requires hospitals to change their operating routines and organizational culture (Chandrasekaran et al. 2012). These changes require extensive investments in training, resolving user resistance and creating buy-in from everyone within the organization (Boulding et al. 2011). To accomplish these tasks, hospitals are undertaking a number of initiatives that are unique to this industry. One such initiative includes setting up the *Office of Patient Experience* (OPX). An OPX is generally tasked with developing and implementing best patient experience practices to ensure that the hospital delivers consistent patient-centered care. It is different from other entities such as 'Patient Council' and 'Patient Relations Office,' which historically have been responsible for interfacing with the patients, surveying patients and resolving patient issues. According to Merlino and Raman (2013), an OPX is a separate organizational entity that is primarily responsible for analyzing HCAHPS surveys, training providers, and working with all the hospital units to identify and fix problems that affect patient experience during their stay. Prior to this office, hospitals traditionally depended on resources from the office of patient safety and quality to tackle patient experience (Senot et al. 2016). While, it is quite possible to improve on EQ through efforts from quality and safety offices, having a dedicated entity such as an OPX can offer hospitals access to full-time staff including managers, data experts, and service excellence trainers (Cosgrove 2014) who are all focused on improving patient experience. Hospitals with OPXs also appoint *Chief Patient Experience Officers* (CXOs) to lead this entity. A CXO often directly reports to the CEO of the hospital.

Thus, an OPX represents a new administrative innovation in the health care industry. Although, there are several studies on the efficacy of new administrative innovations in industries such as manufacturing (e.g., Guler et al. 2002) and services (e.g., Jacobs et al. 2015), applying these findings to health care can be somewhat challenging. Heterogeneity among the adopters (e.g., acute care vs. specialist hospitals), heterogeneity among customers (e.g. patients with different acuity), different objectives for key stakeholders (administrators, attending physician, residents and nurses), and stringent regulations created by the CMS (Joglekar et al. 2016) complicates adoption of new administrative innovations in this industry (Porter 1998). The purpose of our research study is to first investigate this industry-specific challenge by asking the following question: *Does the continued operation of an OPX affect EQ scores in US hospitals?*

Effectiveness of administrative innovations such as an OPX may depend on the characteristics of their organization and its customers. For instance, previous studies on administrative innovation have identified process variability, introduced due to the differences in customers and providers, as key determinants for their implementation success (Damanpour 1987, Kimberly and Evanisko 1981). In health care, process variability can arise due to the different care delivery requirements for the patients. Case mix index (CMI), defined as the average Medicare severity-weight of diagnosis-related groups across discharged patients (cms.gov), is a good indicator of the processes variability that a hospital confronts. CMI is an indicator of patient acuity and their care delivery burden on hospitals. Patients with higher CMI impose a higher documentation burden and require more coordination of care (Hornbrook 1982a,b, Mendez et al. 2014, Steinwald and Dummit 1989, Theokary and Ren 2011, Young et al. 1982). Higher patient acuity and coordination requirements for patients with higher CMI makes the care delivery process more variable and evolutionary in nature, thus augmenting challenges for improving EQ. From the provider side, the presence of residents during care delivery can also be a significant source of variability in care delivery processes (Song and Huckman 2018). Residents often work at a hospital on a short-term basis usually as their first employment after medical school introducing variability in their clinical practices. They also rotate between departments making it difficult for them to get acclimatized to the care delivery processes of individual departments (Blackshaw et al. 2017). EQ measures rated by the patients often do not differentiate between attending physicians and residents (Ratanawongsa et al. 2012) and hence can be affected by a larger presence of residents. We capture this source of process variability through the commonly used measure of resident intensity, calculated as a ratio of the number of residents to beds at a hospital (Theokary and Ren 2011).

The relationship between process variability and effectiveness of administrative innovations is not that straightforward. On one hand, process variations can increase the information processing needs and the degree of coordination required to develop and implement best practices (Galbraith 1973, 1974, Mackelprang et al. 2015), thus increasing the challenges for an OPX to improve EQ. On the other hand, a certain degree of variability allows access to a large pool of data on a range of best practices for the diversified patient and caregiver types. The potential breadth of understanding that can emerge through this data integration effort can in turn help a dedicated entity such as an OPX make meaningful improvements and, as a result, generate better EQ outcomes (Damanpour 1987, Schilling et al. 2003, Tucker et al. 2007). Therefore, the knowledge of how care delivery process variations impact the effectiveness of these administrative innovations is not conclusive. Hence, we further seek to answer the following research question: *What is the relationship between the duration of operation for OPXs and EQ outcomes as a function of care delivery process variability?*

We examine these research questions using a novel dataset on the operation of an OPX within hospitals, their characteristics and performance compiled from seven different sources for the years 2007–2014. We also use qualitative insights from a prominent teaching hospital with a functional OPX to gain an understating of the specific practices administered through these offices. These insights are used to develop our hypotheses and also help triangulate our results. We measure EQ based on an aggregate score of a patient's perception on elements of the HCAHPS survey pertaining to the time between patients calling and caregivers responding for help, and the quality of his or her interpersonal communication with caregivers, namely physicians, residents and nurses. We find that 132 hospitals among 3615 hospitals in our dataset have an OPX within their organizational structure during the study period. We also find that this number continues to grow in recent years. To account for the endogenous nature of setting up an OPX, we used an instrument variable fixed-effects regression approach (Baltagi 1995, Wooldridge 2002) to understand the efficacy of OPX implementation. In order to reduce estimation biases, we use a least absolute shrinkage and selection operator (LASSO) on the first-stage of the IV regression model to identify and select the strongest instruments. Our results suggest that hospitals with an OPX are associated with 1.95% higher EQ for each year of operation. With respect to the effect of patient or provider related process variability, we find that each year of OPX operation is associated with increased EQ as either CMI or resident intensity increases. Specifically, for hospitals with high CMI, we observe a 6.5% improvement in EQ for each year increase in operation of the OPX, with no significant impact observed for hospitals with low CMI. Similarly, for hospitals with high resident intensity, we observe a 1.8% improvement in EQ for each year increase in operation of the OPX, and only 0.9% improvement observed for hospitals with low resident intensity. Hence greater benefits of an OPX are realized by hospitals with high CMI or high resident intensity. This estimate offers the first empirical evidence to the efficacy of these administrative innovations. The significance of these improvements in EQ are better highlighted when compared to only a 0.85% annual improvement in EQ for hospitals that did not have an OPX. The latter estimate (i.e., 0.85%) is based on an average annual change in EQ for hospitals without an OPX, determined independent from our main analysis.

Given the effectiveness of OPXs in improving EQ, we conducted a post hoc analysis to investigate the cost of implementing these offices. We find that the operating costs, which include expenses incurred in every aspect of a hospital's operations, reduce by 1.4% for each year of its existence. These are also sizable improvements in operating efficiencies, especially given the low margins of operation for a vast majority of hospitals—the median operating margin for hospitals in 2018 was 1.7% (Kacik 2019). Our interviews with hospital leadership indicate that these reductions in operating expenses are likely due to increased efficiencies in execution of trainings and other interventions to improve EQ, improved clinical outcomes due to more effective patient-caregiver communication and an increase in patient volumes due to higher patient satisfaction and word of mouth marketing. Further, better EQ scores help hospitals realize better cash flows due to increased value-based purchasing reimbursements from CMS.

Following Senot et al. (2016), we also divided EQ based on the type of task routines triggered during caregiver interactions with the patients: response-focused EQ and communication-focused EQ. Specifically, response-focused EQ measures the caregiver's ability to detect and respond to patient's requests while communication-focused EQ measures the quality of communication with the patients during their stay. From the hospital's standpoint improving these EQ measures require different resources. For instance, in order to improve communication-focused EQ hospitals invest in training programs to teach interpersonal skills, while they invest in technologies such as visual monitoring systems and radio-frequency location systems (Yao et al. 2012) to improve response-focused EQ. Results indicate that OPX is effective in improving both communication-focused EQ and response-focused EQ. Similar to the main analysis, the benefits are stronger for hospitals with higher CMI (communication-focused EQ: 1.6% (high) vs. 0.3% (low); response-focused EQ: 3.6% (high) vs. 1.5% (low)) or residents intensity (communication-focused EQ: 2.0% (high) vs. 0.3% (low); response-focused EQ: 1.2% (high) vs. 0.1% (low)).

Finally, taking cues from our interviews with the OPX and hospital staff at a prominent teaching hospital, we also investigated the impact of the background of the CXO (medical vs. non-medical) on the effectiveness of an OPX. In our dataset, we find that only a small proportion of the CXOs (14.5%) had a medical background, that is, a nursing (RN, BSN) or MD/DO degree. Preliminary evidence suggests that a CXO with a medical background is more effective at improving EQ than a non-medical CXO. Specifically, a hospital with a medical CXO observes a 1.6% improvement in EQ, compared to a 0.1%

improvement in EQ for a non-medical CXO, with each year of OPX operation. This suggests an interesting managerial insight on how to lead these offices in a hierarchical industry such as health care. Taken together, these results offer preliminary insights on the role and efficacy of these new administrative innovations in the health care industry. It also offers important policy implications to CMS on how to prioritize and manage EQ.

## 2. Background and Hypothesis Development

### 2.1. Background

Experiential Quality (EQ) refers to the quality of interactions between the patient and the health care delivery system as perceived by the patient (Bechel et al. 2000). According to Chase and Tansik (1983), health care systems are multistage mixed service organizations where EQ can be influenced by different elements of service delivery. Some of these elements can be central (e.g., interacting with the care providers) while others can be tangential (e.g., technologies) to delivering care. In fact, researchers studying service delivery in general have acknowledged the importance of both of these elements for organizational performance (Homburg et al. 2002, Zeithaml et al. 1988). In accordance with this research, studies specific to health care have measured EQ as a combination of the central and tangential aspects of care delivery (e.g., Bechel et al. 2000, Chandrasekaran et al. 2012, Nair et al. 2013). These studies have also reported a positive association between EQ and care delivery performance. For example, Bechel et al. (2000) report a reduction in length of stay with improved scores, and Senot et al. (2016) find that EQ is associated with reduced 30-day readmission rates.

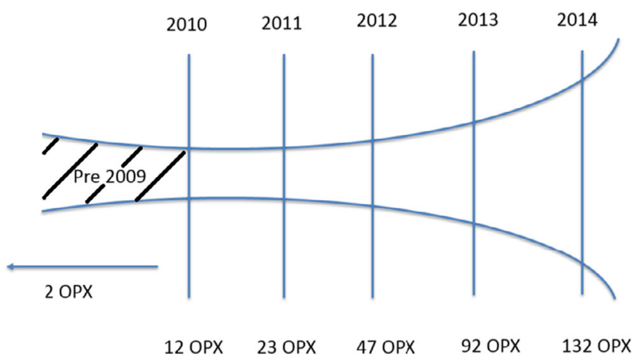
Although the measure of EQ shares facets with customer experience in service settings, it is fundamentally different from the latter. The differences primarily stem from the unique challenges associated with improving EQ compared to improving general customer experience. Heterogeneity among patient populations (e.g., patients with different acuity), multiple points of contact with the patients, care delivery processes and outcomes that are difficult to evaluate by patients, different objectives for key stakeholders (administrators, physician and nurses), and stringent regulations created by the CMS (Joglekar et al. 2016) all complicate developing best practices and implementing a coordinated effort to improve EQ. Therefore the body of knowledge on improving customer experience may not directly apply to improving EQ during care delivery.

Improving EQ scores for hospitals require investments in practices that can improve the patient–caregiver interactions and caregiver responsiveness to patient's needs. Research shows that although caregivers have inherent interest in improving EQ, they consider it as a secondary priority due to the increased workload (Aiken 2002), lack of knowledge on best practices to communicate with patients (Merlino and Raman 2013) and the overreliance on the traditional physician-centric model to delivering care (Groopman 2008). Further complicating the matter is the fact that this high-contact service setting involves employees with significant differences in responsibilities, power, and direct interactions with patients. For example, Harris (1977) described hospitals as non-cooperative oligopolies where caregivers and administrators can sometimes focus on competing objectives, that is, effective care vs. efficient operations, respectively. In a majority of cases, caregivers (especially the physicians) command significant power in this relationship by virtue of their skillset and have been known to influence a number of administrative decisions, including procurement (Aggarwal et al. 1998) and care protocols (Toussaint and Gerard 2010). These dynamics are industry-specific and make the caregivers important stakeholders in the health care setting, yet ones who may not always comply with administrative directives. Merlino and Raman (2013), while discussing Cleveland Clinic's journey towards improving EQ, also acknowledge the challenges associated with bringing caregivers—especially the physicians—onboard with EQ improvement initiatives. Thus, a holistic improvement in EQ scores necessitates buy-in and collaboration amongst different stakeholders with competing priorities, which may require hospitals to invest in newer administrative innovations to facilitate cultural transformations.

***Office of Patient Experience (OPX)*:** The OPX is an administrative innovation designed to promote and nurture EQ as a strategic goal for the hospital. Being an independent entity at the hospital, OPX has its own budget and staff and is led by a CXO who is part of the executive board. Cleveland Clinic is a well-known example of an organization to set up an OPX in 2009 (Merlino and Raman 2013). Figure 1 shows the diffusion of this administrative innovation in the United States as well as characteristics of hospitals adopting OPXs. As see from Figure 1, the number of OPXs has accelerated from just 12 in 2010 to 132 as of December 2014. These 132 OPXs are from hospitals in 30 states with the state of California having the highest number of these hospitals ($n$ = 13 as of 2014).

According to Cleveland Clinic, '*Office of Patient Experience's mission is to consistently provide patient-centered care by partnering with caregivers to exceed the expectations of patients and families*.' Emphasizing patient-centered care not only requires the hospital to establish new procedures and routines but also

**Figure 1** Diffusion of OPX in US Hospitals and Characteristics of Hospitals Adopting OPXs [Color figure can be viewed at wileyonlinelibrary.com]




*Notes.* The figure shows the number US hospitals with active OPXs in a given year. The table shows the average characteristics of hospitals with active OPXs in a given year. For example, in 2012 there were 47 US hospitals with an active OPX. These 47 hospitals had an average CMI of 1.681, Resident Intensity of 0.204 and Beds of 458.

undergo a cultural transformation and shape a new philosophy for care delivery among caregivers. While discussing Cleveland Clinic's journey, Merlino and Raman (2013) acknowledge these challenges and suggest that caregivers have traditionally been focused on the clinical aspects of care delivery and in most cases have neither the inclination nor the knowledge of the drivers that improve EQ. Hence, hospitals not only need to better understand the drivers behind, and develop best practices for EQ, but also provide training to caregivers and bring key stakeholders on board to support the necessary cultural transformation. The mission of an OPX is to manage these issues. In the absence of an OPX, most of these duties come under the directives of the Office of Patient Safety and Quality (Senot et al. 2016), which already has objectives to focus on patient safety and clinical quality outcomes.

As an independent entity with its own annual budget that reports directly to the CEO of the hospital, the OPX is a true reflection of senior leadership directives and is less prone to coercive pressures from the influential entities within the hospital. Because its OPX had this structure, Cleveland Clinic was able to implement a number of tough and unpopular measures like public reporting of individual department EQ scores, a mandatory training program for all employees that cost an average of $11 million, and mandatory hourly rounds by nurses to check on patient needs. Although certain initiatives were mandated across the hospital, for the majority of them the OPX was responsible for working with individual units or caregivers, helping them design and implement solutions specific to their needs. This type of enabling formalization structure, in which individuals or units are not forced into compliance but rather identify problems and are part of the solution, has been shown to be effective in cultural transformation and performance improvement (Adler and Borys 1996). Although the structure of the OPX has aspects that have been shown to be effective at supporting organizational change, the fact that its mission can sometimes be at odds with the typical performance measures (e.g., physician productivity) and requires a cultural transformation highlights the potential for resistance among the key stakeholders. Resistance from key stakeholders has been shown to result in the failure of initiatives involving cultural transformation. For example, Scott et al. (2005) found that resistance from physicians to new routines introduced as a part of Electronic Medical Records (EMR) adoption resulted in the abandonment of EMR adoption. In addition, evidence from literature on the efficacy of administrative innovations directed towards improving non-traditional performance measures is inconclusive (Barnett and Salomon 2006, Zhu and Westphal 2014) and existing literature wanting. Luo et al. (2015) offers a nice summary of these studies and calls for more industry-specific research to focus on non-traditional outcomes. Our study is intended to fill this gap in the literature.

### 2.2. Insights from the Field

To better understand the rationale behind OPXs formation and to get more insights on the specific practices and training programs, we collected qualitative insights from a prominent Midwestern teaching hospital (referred to as HOSP1) that set up an OPX in 2011. Prior to this office, initiatives to improve on EQ were made possible through the office of patient safety and quality. We specifically interviewed their CXO, 4 physicians, 9 nurses, and several patient experience employees. Appendix A gives more details on this site, the type of data collected as well as the protocols used during these interviews. We relied on this data to gather insights that are later used in the development of our hypotheses and in explaining our empirical results.

### 2.3. Hypothesis Development

We draw from three different literature streams to develop the hypotheses for this study. When looking at the relationship between OPX and EQ, we use arguments from the coercive and enabling formalization literature (Adler and Borys 1996) and learning curve (Baloff 1971, Netland and Ferdows 2016, Wright 1936, Yelle 1979). The OPX can be viewed as an enabling formalizing structure that helps departments find resources and coordinate efforts to implement management's strategic objective of improving EQ. Due to improvements through learning by doing we argue that the effectiveness of an OPX should improve over time after the formation of these offices. For our hypotheses pertaining to variability in care delivery processes introduced due to patient CMI and resident intensity, we use arguments from the Information Processing theory literature (Galbraith 1974, Kitchen and Spickett-Jones 2003). The Information Processing theory literature informs us about the coordination challenges, information processing needs and its impact on performance as process variability increases. We also use qualitative insights from the interviews with the OPX and hospital staff from HOSP1 to offer specific examples of practices facilitated by this office.

**2.3.1. Duration of OPX and EQ.** Office of Patient Experience adoption represents a strategic choice on the part of the hospital administration to promote a culture that emphasizes EQ. Through formalized structures like an OPX, senior management can set targets for improvements, identify specific actions that need to be addressed, and handle exceptions (Abernathy and Brownell 1999, Simons 1991, 1994, 1995). From this standpoint, OPX can be thought of as a management control system designed to achieve the strategic goal of improving EQ (Simons 1991). Specifically, OPX is designed as an enabling formalization structure, which has been shown to be more effective compared to other management control systems. An enabling formalization structure facilitates departments and employees within these departments to achieve goals by developing appropriate structures and systems to capture learning rather than forcing compliance (Adler and Borys 1996). Note that individual clinical units do not report to an OPX and only work with it in a collaborative spirit. The OPX is designed as an independent entity that works with each department to develop and share best practices by analyzing HCAHPS surveys, interpreting patients' complaints, training employees, examining data analytics, collaborating across departments, and identifying and supporting EQ improvement initiatives (Merlino and Raman 2013). At HOSP1, we found that these duties were initially performed under the office of quality and safety. When asked for the reasons for creating this entity, the CXO who is also a physician had the following response:

> HOSP1 being a large academic medical center, we found a tension between patient experience (EQ) and quality measured through patient safety. We felt that creating this office allows us to have committed resources as well as committed strategy to improve patient experience without drawing resources from other quality initiatives.

Through OPXs, hospitals can facilitate improvements within the department by empowering department staff rather than mandating changes. This is made possible due to presence of specialized resources through these offices. For example, at HOSP1, there were 20 FTEs who are trained in conflict management, having crucial conversations, and empathy training. Further, these employees have different backgrounds ranging from hospitality, nursing to social work. These employees, with their diverse background and skills, provide unique resources to individual departments that help better design and execute improvement initiatives. The CXO at HOSP1 mentioned that a major advantage of an OPX is that their staff '*proactively round to assess any issues before they arise*,' which was not the case when they were part of the patient safety and quality department.

In addition, having the OPX allows hospitals to work in consultation with individual departments to develop metrics and targets for improvement. This gives departments' greater autonomy when implementing the changes. As an example, the emergency department (ED) medical director at HOSP1 had the following comments:

> ED is a unique part of a hospital where patient experience metrics depend on ensuring patients are seen on time without delays and reducing the patients left without being seen measure. This means, the initiatives at ED to improve flow would be different than in a surgical ward. Having the OPX work with our staff and develop these measures has been critical for our success

Previous research shows that characteristics like incentivizing departments to improve through strategic metrics, providing them adequate resources to succeed, and giving them autonomy in planning and implementing changes are indicators of an enabling formalization structure (Adler and Borys 1996). This type of structure provides incentives and support to hospital employees (administrators and caregivers) to contribute towards improving EQ. In a study of neonatal care units, Tucker (2007) draws similar conclusions about the importance of having formalized structures for empowering frontline employees to work on continuous improvement projects. Similar benefits of an enabling formalization structure are reported by Tucker and Singer (2015). Thus, the enabling formalization structure of an OPX should have a positive impact on patient EQ.

When looking at opportunities to improve EQ, initiatives that improve responding to a patient call for help require hospitals to develop technological solutions that are integrated into the daily work of the caregivers. For instance, a study conducted at a large academic medical center with an OPX found that in order to improve its responsiveness to patient needs, the hospital implemented patient room technologies using an external vendor (Carpman and Grant 2016), while also training all its nurses on fully utilizing some of the features including real-time patient location, hand hygiene monitoring and bedside video assistance. The authors go on to suggest that most often these training programs are not conducted resulting in underutilization of these technologies. An entity like an OPX can help plan the development and rollout of such initiatives.

The presence of OPX can also help improve the communication between caregivers and the patients. Research shows that improving communication scores requires active buy-in from the caregivers on the importance of EQ. Such buy-in will ensure that caregivers learn the most from training programs and are motivated to implement on–the-job initiatives to improve patient EQ (Luxford et al. 2011). Since caregivers are affiliated with the hospital (either as employees or through contracts), they are more likely to comply with top management directives, especially when their individual incentives are aligned through formalization structures like an OPX. For example, Luxford et al. (2011), in a qualitative study of eight health care organizations, finds that having an organizational entity with formal measurement structure and incentives is important for improving EQ. Having such a structure provides additional compliance incentives to caregivers who are already overworked and have job-related stress as evidenced by their high burnout rates—30–40%, (Aiken 2002, Dyrbye and Shanafelt 2011). Furthermore, evidence shows that hospitals often lack a clear understanding on the factors that can develop communication and empathy among their caregiving teams (Merlino and Raman 2013). Having an OPX can allow hospitals to identify best practices related to improving communication with the patients, which can result in better training programs customized to caregivers (i.e., nurses and physicians) and hospital departments. An effective formalization structure, appropriate training of caregivers, and support for departmental improvement initiatives provided by an OPX can help transform a hospital's culture towards the delivery of patient-centered care. As an example, HOSP1 conducts empathy training to all their providers once a year to illustrate the importance of communication. This training program is fully funded through the OPX and is used as an opportunity to lead the entire care team, including procurement and food personnel, to understand how their work affects patient care. The OPX staff at HOSP1 also proactively round with the care providers in various units allowing them to observe and train them on communication as a part of their work.

Finally, developing protocols to support a formalization structure like an OPX, achieving buy-in from key stakeholders and implementing difficult improvement initiatives can take time. Development of best practices for improving EQ is a process of learning by doing. Due to the time required to rollout initiatives and efficiencies realized from learning by doing, we anticipate that the effectiveness of an OPX will increase with its length of operation. Netland and Ferdows (2016) observed a similar trend towards improved effectiveness over time, when studying the implementation of lean programs at 45 Volvo plants. Taken together, these arguments suggest that an OPX is likely to improve EQ, its effectiveness improving over time. This leads us to our first hypothesis.

H1. *A hospital's performance on EQ will improve with continued operation of its OPX.*

**2.3.2. CMI, Duration of OPX and EQ.** The success of OPXs in improving EQ may depend on the degree of variability in care delivery processes introduced due to different needs and care delivery requirements of patients. In health care, the case mix index (CMI) of the patients captures the patient acuity and the resulting hospital resources required to treat a patient (Hornbrook 1982a,b, Mendez et al. 2014). Patients with higher CMI generally impose a higher documentation burden and require more coordination of care (Steinwald and Dummit 1989, Theokary and Ren 2011, Young et al. 1982). Patients with higher CMI will require care from caregivers with multiple different specialties, which will increase the coordination during care delivery. Further, the sequencing and timing of clinical interventions, corresponding lab tests to determine the care delivery process, and subsequent interactions between providers from different specialties introduce a higher degree of subjectivity. Associated increased opportunities for lags between steps, even minor ones, are more likely to introduce oscillation in performance (Dong et al. 2018) and makes the care delivery process more evolutionary (i.e., less standardized) in nature for patients with high CMI. Additionally, the increased acuity of high CMI patients also necessitates meeting different expectations from the patients regarding the quality of care delivered (Campbell and Frei 2011, Hitt and Frei 2002). A more adverse condition, may also impact a patient's physical and mental state (Merlino and Raman 2013), making it more difficult to engage and communicate with them thus increasing challenges with improving EQ scores. These factors combined can make it difficult for hospitals with higher CMI patients to excel in EQ without having a dedicated organizational entity.

Based on the Information Processing theory (Galbraith 1974, Kitchen and Spickett-Jones 2003), we argue that hospitals with higher CMI patients will demonstrate greater improvements in EQ with increase in the duration of the OPX. As CMI increases, the information processing needs of the hospital will increase in order to effectively manage the heterogeneity in care delivery processes and heightened coordination of care requirements (Galbraith 1973, Weigelt and Sarkar 2012). Greater CMI also mandates the management of greater diversity in data and information regarding patient needs and preferences. In the presence of this diverse content, hospitals with an OPX are better able to process information and coordinate efforts with other departments in comparison with hospitals without an OPX. In addition, having an OPX allows hospitals to share best practices across diagnosis-related groups (DRGs) and provide support for improvement programs that can help improve the hospital's overall EQ scores. In the absence of an OPX, all of these duties essentially fall under the Office of Quality and Safety, which has other responsibilities like reducing preventable medical errors and hospital-acquired infections, and therefore prioritizes EQ less (Joint Commission 2007). Hence, as CMI increases, the benefits of having an independent OPX may increase. We expect all aspects of EQ to benefit from the support provided by an OPX in the face of increased CMI. When asked about the effect of OPX when managing heterogeneity in patient requirements, the CXO at HOSP1 had the following point:

> One of the key objectives of the OPX when dealing with a wide variety of patients is to improve communication between providers and patients. Patients nowadays have access to rich information that allows them to choose their care providers. The first impression becomes very critical since we can easily lose them to our competition that is 3 miles away. Communicating with them on the quality of care, preventively solving their problems during stay through patient experience team roundings are some of the new initiatives deployed after the formation of our OPX. All of these have helped us improve on the HCAHPS (Experiential quality) scores

Dimensions of EQ related to responsiveness will benefit with increases in CMI, as hospitals are able to acquire diverse information on the needs and preferences of their patients regarding the delivery of care. As an example, consider a hospital that has multiple DRGs and is trying to improve responsiveness to different patient needs. They may include a variety of items with different urgency levels such as managing pain after surgery, responding to a bed fall, and responding to questions regarding medications. Having a dedicated entity such as an OPX can help collect and triangulate patient requests data as well as develop protocols for responding to these requests in a manner that optimally matches urgency with resource utilization.

Increase in CMI can also give rise to challenges when attempting to improve communication between caregivers and patients. Studies show that an increase in CMI can create greater procedural variability in documentation and coordination efforts (Queenan et al. 2016). These conditions necessitate a higher degree of customization and greater reliance on external information (e.g., laboratory tests, health information technology) for effective patient communication. Under these conditions, having an OPX can help design customized unit-level solutions and protocols, identify drivers of effective communication for different patient profiles, and provide training to caregivers in comparison with the status quo of not having an OPX. In addition, improvements in communication may require buy-in from physicians and nurses in several departments (e.g., oncology, surgery) that have different types of patients. These requirements magnify with increases in CMI. For instance, improving EQ for transplant patients requires teaching caregivers to coordinate patient care with several providers, given the chronic nature of the patient population (McAdams-DeMarco et al. 2012). These patients also have other forms of co-morbidity (e.g., diabetes, depression) and hence may benefit from coordination with other providers (e.g., clinical psychologists). Thus, the presence of a dedicated entity like an OPX to develop and implement customized solutions can improve EQ at higher levels of CMI.

Finally, due to the time required to rollout initiatives and efficiencies realized from learning by doing, we anticipate that the strength of the positive moderation between CMI and OPX will increase with the duration of these offices. Taken together, these arguments suggest that having an OPX is likely to improve EQ in hospitals that treat higher CMI patients, its effectiveness improving over time. This leads us to the next hypothesis.

H2. *CMI positively moderates the relationship between length of operation of an OPX and EQ.*

**2.3.3. Resident Intensity, Duration of OPX and EQ.** The success of OPXs in improving EQ will also depend on the degree of variability in care delivery introduced due to increase in resident intensity. In the health care setting, resident intensity is captured by the ratio of the number of residents to beds at a hospital (Theokary and Ren 2011). Residency is a three to 5 years training period for new physicians following their medical school training. The residency program starts in the month of July, indicating a turnover of experienced (graduating) residents and an influx of inexperienced residents every year. This disrupts existing caregiver teams, results in a loss of experienced residents, imposes the need to train new incoming residents and introduces variability in care delivery processes. Song and Huckman (2018) found this cohort turnover negatively impacts care delivery outcomes. In addition to the annual cohort turnover, residents undergo frequent rotations across units. As an example, consider Yale medical school which requires residents to complete frequent rotations which may last only two weeks across different departments (Yale School of Medicine 2019). A similar schedule for resident rotations is also followed by the Duke medical center (Duke University School of Medicine 2019). These frequent rotations not only result in process disruptions, they also make it difficult for residents to become intimately aware of care delivery protocols in individual units (Huckman and Barro 2005). Thus, resident intensity represents a good proxy to capture variability introduced due to resident turnover and rotations.

In addition to care delivery variability introduced due to resident turnover and rotations, medical education itself is wanting on training with respect to patient communication. A number of studies (Hulsman et al. 1999, Makoul 2003) have alluded to the medical education as being more focused on clinical priorities and less on communication. We argue that a dedicated entity focused on improving patient experience, like an OPX, will help alleviate some of these challenges associated with residency programs. In HOSP1, the OPX institutes specialized training programs for the residents and fellows on how to communicate with patients. This involves in-depth feedback on the resident rounding practices by the OPX staff.

We argue that hospitals with higher resident intensity will demonstrate greater improvements in EQ scores with increase in the duration of OPX. As resident intensity increases, the information processing needs of the hospital will increase in order to effectively manage the increased care delivery process variability (Galbraith 1973, Weigelt and Sarkar 2012). Greater resident intensity will necessitate collecting information on the resident rotation schedules, specific unit protocols that residents need to learn, and shortfalls in their training with regards to patient communications. Under these conditions, having an OPX can help design customized unit-level rotation plans, identify drivers of effective communication for different resident profiles, and provide training to residents. OPXs allow for patient-centric training initiatives focused on ideal patient pathways that can place the entire care giving team on a common footing, hence reducing the impact of frequent changes in team composition due to resident addition and attrition. OPXs can also create additional training programs that help streamline discharge instructions and help create standard operating procedures related to patient communication. As an example, consider the well-known initiative from the Cleveland Clinic on the practice of patient-centered institutes (Cosgrove 2014). After the establishment of their OPX, Merlino and Raman (2013) report that Cleveland Clinic redesigned their model of care to involve 27 patient-centered institutes across various specialties. For instance, the anesthesiology institute integrates all specialists in pain management, general anesthesia, pediatric and congenital heart anesthesia, cardiothoracic anesthesia and critical care in a way that residents and physicians understand the role of coordination and communication across medical silos. This helped the clinic minimize redundancies and improve patient experience.

In addition, OPXs can also help facilitate individualized training, such as observations of interactions with patients followed by feedback on improvements (Briggs et al. 2018), simulated interactions (Mitchell et al. 2016) and formal classroom/web training (Briggs et al. 2018), to help improve resident communication skills. Thus, having a dedicated entity like an OPX to develop and implement customized solutions can improve EQ at higher resident intensity hospitals.

It is also worth noting that a more established OPX (more years in place) may prove particularly advantageous to high resident intensity settings, for at least a couple of reasons. First, over time, these offices can establish a standard or culture of emphasizing EQ that might otherwise be foreign to new residents, helping to ensure that the focus of these new care givers is oriented towards the experiential objectives of the hospital. Further, the longer an OPX is in place, in line with the learning by doing arguments stated earlier, the more familiar the office will be with issues that can arise from the presence of a large number of residents. Hence they are more likely to have adaptation solutions in place that are robust to resource turnover. Since that turnover is a substantial distinction from hospitals with less resident intensity, higher intensity settings are those in which this value should be increasingly visible.

H3. *Resident intensity positively moderates the relationship between length of operation of an OPX and EQ.*

# 3. Research Methods

## 3.1. Data Collection

We investigated our hypotheses using a novel dataset on the office of patient experience (OPX), hospital characteristics and performance compiled from multiple data sources for the years 2007–2014. The secondary data sources used for this study include CMS HCAHPS data on EQ, Medicare Cost Reports, and process-of-care data for hospital characteristics and other controls. In addition to these secondary data sources, data on the functioning of an OPX was collected through manual web searches on the individual hospital websites as well as phone conversations with the hospital administrations for further validations.

We developed a standardized data collection template (i.e., manual searches and phone calls) to ensure reliability during the data collection process. Two researchers first created and tested this template and then passed it on to six undergraduate students who collected data on the presence of an OPX from 3615 hospitals from the CMS database. We excluded rehabilitation centers, psychiatric centers, and veteran administration centers from the final dataset due to significantly different operations and patients in comparison with acute care and specialty hospitals. The following three criteria were used to identify the presence of an OPX. (i) An entity named OPX exists within the hospital, (ii) the OPX is an independent entity with its own budget and staff, and (iii) the OPX is headed by a CXO (or a similar role designation like Director of Patient Experience or Vice President of Patient Experience) who is a member of the executive board of the hospital. The information on the presence of an OPX was collected using searches on the hospital website and LinkedIn.com in conjunction with hospital phone calls to validate their positions. Each of the six undergraduate students independently collected information on one-third of the hospitals in the sample, resulting in two independent data points for the same hospital. We then matched these two independent data points for each hospital to ensure reliability. The average inter-rater reliability among the coders was 0.90 (total agreements/(total agreements + total disagreements)). One of the researchers then validated any discrepancies in the coding process reported by the students. At this stage, we also collected any missing values on the operation of the OPX through phone calls to individual hospitals.

Finally, we combined the manually collected data with other secondary data sources, resulting in a sample of 3615 acute care hospitals. Of these, 132 hospitals had an OPX within their organizational structure, which were started at different time points during our study (refer Figure 1). Once established, each hospital continued to operate these offices for the duration of our study (validated through our phone calls and Internet searches). These hospitals were located in 30 states, with California having the highest number of hospitals with an OPX ($n$ = 13 in 2014). Note that our data analysis involves using the entire population of acute care hospitals that report to CMS which includes the 132 OPX hospitals (entire population of hospitals with an OPX) and hence there is no sampling bias in our study. Even though OPXs were established by 132 hospitals during our study period, it is important to include the entire population of hospitals for analysis because our dependent variable (EQ) could be impacted by factors other than the OPX. Excluding hospitals that did not adopt an OPX could introduce systematic selection bias in the estimates of other independent variables (e.g., case mix index and resident intensity) as well as their interactions with the length of operation of the OPX. Finally, we conducted power analysis to determine if our sample size is sufficiently large to appropriately estimate the impact of an OPX and its interactions with CMI and resident intensity on EQ. A power of 0.8 is generally used as an acceptable level and indicates that 80% of randomly drawn samples from the population would support the hypothesis at $\alpha = 0.05$. Power analysis revealed sufficient power (>0.8) to test our hypothesis at $\alpha = 0.05$.

## 3.2. Variable Descriptions

**3.2.1. Dependent Variables.** *Experiential quality (EQ)*: This variable measures the quality of interactions between the caregivers and patients as perceived by the patient at a hospital (Chandrasekaran et al. 2012). To calculate this measure six percentile items from the HCAHPS survey were averaged ($P_i$) and then a logit transformation applied to the average score. The HCAHPS survey items that are averaged include, (i) How often did doctors communicate well with patients? (ii) How often did nurses communicate well with patients? (iii) How often did patients receive help quickly from hospital staff? (iv) How often did staff explain about medicines before giving them to patients? (v) How often was the patient pain controlled? (vi) Were patients given information about what to do during their recovery at home? These measures were developed by CMS and the U.S. Agency for Health care Research and Quality (AHRQ) in 2006. Results are reported on the CMS Hospital Compare website after being aggregated at the hospital-level and adjusted by CMS for patient characteristics such as education, self-rated health, primary language, age, and service line that are beyond a hospital's control and might affect patients' answers to the survey (www. hcapsonline.org). Following CMS guidelines, only EQ based on a sample of more than 100 respondents for HCAHPS scores were included in our study. The EQ score for a hospital $i$ with a percentage score $P_i$ is given by,

$$S_i = \mathrm{Ln}\left[\frac{Pi}{1 - Pi}\right] \tag{1}$$

As a robustness check, we also tested the hypothesis using a measure of EQ that is based on confirmatory factor analysis (CFA) for the six HCAHPS scales mentioned above. The results remain consistent with the main analysis and are presented in section 4.5.1.

**3.2.2. Independent Variables.** *Duration of OPX*: This variable indicates the duration over which an OPX has operated, i.e. its length of operation, and is calculated as a difference between the current year incremented by one and its year of origin, that is, Duration of OPX = Current year + 1 − Year of Origin. A hospital is considered to have an OPX when the following conditions are met: (i) an entity named OPX exists within the hospital, (ii) the OPX is an independent entity with its own budget and staff (verified through hospital sources), and (iii) the OPX is headed by a CXO (or a similar designated role) who is a member of the executive board at the hospital. This variable was derived from manual searches of the individual hospital websites or phone conversations with hospital staff. The mean duration of OPX in our sample was 2.15 years.

*Case mix index (CMI)*: The CMI is an indication of patient acuity and their care burden on hospitals (Hornbrook 1982a,b, Mendez et al. 2014, Steinwald and Dummit 1989, Theokary and Ren 2011, Young et al. 1982). Patients with higher CMI generally impose a higher documentation burden and require more coordination of care, resulting in increased variability in care delivery and administrative procedures. The calculation of CMI is determined as a weighted average of the patient volume categorized by Diagnosis-Related Groups (DRGs), with the weights indicating the complexity of treatment associated with the DRG. We derived this variable from the CMS database. The mean Case Mix Index of our entire sample is 1.41, and 1.60 for hospitals with an OPX.

*Resident intensity*: This variable is calculated as the number of full-time residents divided by the number of beds at a hospital (Theokary and Ren 2011). Resident intensity represents a good proxy to capture variability in care delivery processes introduced due to resident turnover, rotations and due to the involvement of relatively inexperienced resident physicians in care delivery. The mean resident intensity in our entire sample is 0.06, and 0.2 for hospitals with an OPX.

**3.2.3. Control Variables.** We used a fixed effects instrumental variable regression approach; hence, time invariant hospital-level variables (e.g., ownership structure, location) and state-level variables (e.g., state legislation) are not included as controls in the model. However, several time variant variables can influence EQ and hence are controlled for in our analyses. Specifically, we control for hospital characteristics such as *payer mix* and *size* to account for hospital-level differences. Hospital size is measured using bed count, while we derived the payer mix from the CMS impact files measured as the ratio of Medicare insured patients to total patient volume at a given hospital. Hospitals with high payer mix will likely have higher EQ scores due to potentially higher penalties under the ACA legislative mandates. We also control for the *length of stay* (LOS) of a patient at the hospital, since stay duration can impact EQ. Finally, we added dummy variables for each year in the regression model to control for time fixed effects.

## 4. Results

Table 1 gives summary statistics on the key variables used in the analysis. We also use these correlations to check the validity of the data used in the analysis. The positive and significant correlations between CMI and resident-to-bed ratio ($r$ = 0.35; $p$ < 0.1) reinforce the fact that teaching hospitals have a higher case severity. Additionally, the correlation between the number of beds and operating cost is positive and significant ($r$ = 0.15; $p$ < 0.1), reinforcing the fact that hospital operating cost increases with size. These correlations provide validity for the data used for the analysis.

### 4.1. Estimation Approach

Hypotheses 1–3 evaluate the impact of an OPX in improving EQ as well as its effectiveness for hospitals with different CMIs and resident intensities. A concern while evaluating hospitals' strategic choices, such as the adoption of an OPX, is the endogenous nature of these decisions. The decision to adopt an OPX may be driven by a number of institutional and legislative factors that can also impact hospital performance, leading to endogeneity concerns. As an example, better managed hospitals are more likely to have higher EQ scores. These hospitals are also more likely to be initial adopters of new initiatives such as OPX, thus making our estimates of the impact of OPX on process quality measures (e.g., EQ) biased. Similar to the decision to adopt an OPX, CMI may be related to

**Table 1 Summary Statistics and Correlations**

| | | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | CMI | 1.41 | 0.29 | 1.00 | | | | | | | |
| 2 | Resident Intensity Ratio | 0.06 | 0.15 | 0.35* | 1.00 | | | | | | |
| 3 | Beds | 201.6 | 193.1 | 0.57* | 0.50* | 1.00 | | | | | |
| 4 | Payer Mix | 0.46 | 0.14 | −0.35* | −0.36* | −0.32* | 1.00 | | | | |
| 5 | Experiential Quality | 0.97 | 0.27 | −0.07* | −0.17* | −0.31* | 0.14* | 1.00 | | | |
| 6 | LOS | 4.47 | 1.12 | 0.26* | 0.33* | 0.29* | −0.11* | −0.20* | 1.00 | | |
| 7 | Operating Cost | 13.33 | 0.66 | 0.46* | 0.26* | 0.15* | −0.38* | 0.06* | −0.01 | 1.00 | |
| 8 | Duration of OPX | 0.02 | 0.25 | 0.09* | 0.07* | 0.11* | −0.04* | 0.01* | 0.03* | 0.07* | 1.00 |

*Note*. $^*p < 0.1$.

a number of unobserved factors that may also drive performance leading to endogeneity concerns. Resident intensity may not suffer the same concerns as the other two since the size of the residency program is a long-term decision and is unlikely to change over the short period of time. Moreover, some of the factors affecting the residency program such as affiliation to academic hospital are accommodated through our fixed-effects estimation strategy. Hence our main analysis treats resident intensity as exogenous. This approach to model resident intensity is comparable to other similar studies that have treated teaching status/resident intensity as exogenous (Theokary and Ren 2011). A Durbin–Wu–Hausman test (Davidson and MacKinnon 1993) of endogeneity for the resident intensity variable, while accounting for endogeneity in OPX and CMI, turns out to be insignificant ($p > 0.1$), supporting our assertion.

To mitigate endogeneity concerns with the OPX and CMI variables, we performed an instrument variable two-stage least squares (2SLS) within estimator (fixed effects) regression for testing our hypotheses (Baltagi 1995, Wooldridge 2002). Several other studies have used this approach to correct for endogeneity when dealing with data that has similar structures (e.g., Kesavan et al. 2014, Siebert and Zubanov 2010, Tan and Netessine 2014). When dealing with multiple sources of endogeneity (e.g., omitted variables, selection issues, etc.), recent research shows that a 2SLS estimation procedure is effective when compared to other models such as Heckman-Self Selection (Certo et al. 2016). A Durbin–Wu–Hausman test (Davidson and MacKinnon 1993), which compares the regression estimates for the instrumented and non-instrumented models turns out to be significant ($\chi^2(2) = 517.2$; $p < 0.01$), lending further support to endogeneity concerns. The Davidson–MacKinnon test (Davidson and MacKinnon 1981) with a null hypothesis that an OLS regression model will yield consistent estimates when compared to the instrumental variable fixed effects regression model turns out to be significant ($p < 0.05$), thus favoring the instrumental variable fixed effects regression model. Finally, the GMM-distance test (Baum et al. 2003) which is a Hausman test equivalent in the presence of heteroscedasticity is also significant ($p < 0.05$) supporting the choice of an IV regression model. We chose the within effects estimator (i.e., fixed effects over random effects) based on the Hausman test, which turned out to be significant ($\chi^2(11) = 88.52$; $p < 0.01$), thus providing evidence to reject the null and use the fixed effects model. Further, a within effects estimator is ideal in this case, given that hospitals without an OPX may be implementing alternative strategies to improve their EQ scores, thus making across hospital comparisons problematic.

For instruments to be valid they must be correlated with the endogenous variables and be independent of the error terms. We use the *percentage of hospitals in a state with an OPX* (called *OPX Bandwagon*) and the *county level vote difference* (named *Vote Split*) between republican and democratic presidential candidates in the 2012 election as instruments for the presence of OPX. The first instrument—OPX Bandwagon, represents the bandwagon effect, or tendency to mimic competition, and can influence hospitals' OPX adoption decisions (Abrahamson and Rosenkopf 1993). This variable has a significant correlation with the duration of OPX ($r = 0.19$; $p < 0.01$). A larger percentage of hospitals with an OPX within a state, i.e. higher *OPX Bandwagon*, will likely influence the adoption and continued operation of OPXs at hospitals within the same state (and hence be correlated with the endogenous variable). However, *OPX Bandwagon* will not directly influence EQ at the hospital (which is a result of hospital specific processes), making it a good instrument. This type of instrument is not new to the adoption research and is "*in the spirit of*" Hausman (1996) instruments. Studies following this approach have used average price for other products in the same market or average price for the same product in other markets as an instrument for price of a product. For example, Ghose and Han (2014), when looking at demand for mobile apps, use an aggregate of characteristics of apps offered by the same app developer and an aggregate of characteristics of apps offered by other app developers as instruments for price.

For the second instrument—*vote split*, we use the *county level vote difference* between the republican and democratic presidential candidates in the 2012 election. This instrument is derived from the 2012 presidential election vote distribution by county available through US Government open data (data.gov). Given the non-bipartisan nature of the ACA legislation, the political climate in the region served by the hospital could influence its decision to adopt an OPX. Specifically, based on the Real Options theory (Dixit et al. 1994, McDonald and Siegel 1986), we argue that due to uncertainty with the ACA mandates (which includes experiential quality measured through the HCAHPS survey), hospitals in regions with political climate that opposes this legislation may defer investments in setting up and running expensive entities like an OPX. Hospital administrations' opinions about the longevity of a legislation will be impacted based on their local political climate, which creates an option to delay investments in initiatives supporting the mandates (especially expensive ones like setting up and running an OPX). Options have value when their cost is less than the present value of the investments benefits. Hence, uncertain legislative mandates can create a positive option value by delaying investments to support its mandate. The vote split in the county of the hospital, which indicates the political climate in that county, will be a good indicator of the decision of a hospital to invest and run an OPX. This variable however is unlikely to influence the HCAHPS scores at a hospital—which is a result of operational actions taken by a hospital, hence making it a good instrument. This line of reasoning is also consistent with other recent studies in public policy that finds local factors that constitute internal determinants of innovation adoption (Berry and Berry 2018) to be stronger predictors than other institutional pressures (Berry and Berry 2018, Krause 2011). For example, in a study of greenhouse gas reduction across 900 US cities, Krause (2011) found that local-level (county and city) characteristics such as percentage of Democratic voters in the county had a strong association with the Mayor's likelihood to sign the climate protection agreement. In fact, this impact was stronger than that of external state level factors such as government ideology and climate action plan for the region under the Kyoto protocol. In our study, the *vote split* has a significant correlation with the duration of OPX variable ($r = -0.05$; $p < 0.01$).

For CMI, we use the unemployment density and wage index in the county of the hospital as instruments. The unemployment density and wage index are indicators of the economic condition of the neighborhood served by the hospital and will likely be correlated with the services offered by the hospital. In addition, these economic indicators should not influence EQ at the hospital (which is a result of hospital-specific processes and not the neighborhood conditions), making it a good instrument. These variables are correlated with the CMI variable (Wage index: $r = 0.23$, $p < 0.01$; Unemployment density: $r = 0.16$, $p < 0.01$). Jha et al. (2008) when comparing HCAHPS scores by city find no evidence of population economic indicators having a direct impact on HCAHPS scores of hospitals within the region. For example, Jha et al. (2008) note that Birmingham and Milwaukee patients highly recommend their city hospitals, while Chicago and Fort Lauderdale do not (table 5 in p. 1930). Yet Birmingham and Milwaukee have lower wage indices and equal or higher unemployment levels. Knoxville and Orlando have very different recommendations, yet both have comparably lower unemployment and lower wage indices than these four cities. This study provides additional validation for our choice of instruments. In subsequent models where duration of OPX and CMI interact with themselves or other exogenous variables, we additionally include the interactions between our instruments and the exogenous moderator as instruments for both the endogenous variable and the endogenous interaction term (Bun and Harrison 2018).

Finally, in order to reduce biases associated with using a large number of instruments, and/or weak ones, we choose the strongest instruments by using a least absolute shrinkage and selection operator (LASSO) on the first-stage regression (Tibshirani 1996), using the post-double-selection (PDS) methodology proposed in Belloni et al. (2012, 2014a,b, 2015, 2016). LASSO runs a penalized regression, where instruments are added to the first stage model—each addition incurring a penalty. This penalty is determined based on the data structure. Regressor-specific penalty loadings for the heteroskedastic and clustered cases are derived following the methods described in Belloni et al. (2012, 2014a,b, 2015, 2016). The strongest set of instruments for each endogenous regressor are identified and then the union of these instruments is used in a standard IV regression model. The regression equation modelling EQ for hospital $i$ in time period $t$ is presented below:

$$Y_{i,t} = X_{i,t}\beta + \hat{Z}_{i,t}\gamma + \alpha_i + \varepsilon_{\mathrm{i,t}}, \tag{2}$$

With a first stage equation,

$$Z_{i,t} = X_{i,t}\theta + S_{i,t}\tau + \upsilon_{i,t}, \tag{3}$$

where, $Y_{i,t}$ is the EQ score for the hospital, $X_{i,t}$ is the vector of exogenous regressors, $Z_{i,t}$ is the vector of endogenous regressors, $\boldsymbol{\alpha_i}$ are the hospital specific fixed effects and $S_{i,t}$ is the vector of instrumental variables. The vector of instrumental variables is selected using the LASSO estimator which minimizes the following objective function,

$$Q(\theta,\tau) = \|Z_{i,t} - X_{i,t}\theta - S_{i,t}\tau\|^2 + \lambda\sum_{j=1}^{n}\tau_j \quad (4)$$

Table 2 gives the results of the fixed effects IV regression model with LASSO selected instruments.

For each of the regression models in Table 2, the maximum VIF is less than 10 indicating that multicollinearity is not a concern. Under-identification test using the Kleibergen–Paap rk LM statistic shows that our models are adequately identified ($p < 0.05$) (Kleibergen and Paap 2006). The Cragg–Donald Wald *F* statistic are all above the Stock–Yogo weak identification test critical values of 10% maximal relative bias and size (Stock and Yogo 2005), which supports the strength of our instruments. We test the overidentifying restrictions (the unobserved error process and our instruments are orthogonal), using the Hansen *J* statistic (Hansen 1982). We do not find significant correlation across all models ($p > 0.05$). Overall, the test results jointly support the validity of our instruments.

**Table 2 Fixed-Effects Instrument Variable Regression Model for Experiential Quality Using LASSO for Instrumental Variable Selection**

| | Experiential quality | | |
|---|---|---|---|
| | Model 1 | Model 2 | Model 3 |
| Duration of OPX | 0.078** | 0.126* | 0.055 |
| | (0.038) | (0.071) | (0.037) |
| CMI | 0.893*** | 0.561*** | 0.443*** |
| | (0.306) | (0.205) | (0.135) |
| Resident Intensity | 0.024 | −0.080 | −0.097** |
| | (0.050) | (0.059) | (0.047) |
| Duration of OPX × CMI | | 2.98** | |
| | | (1.34) | |
| Duration of OPX × Resident Intensity | | | 5.08* |
| | | | (2.83) |
| Beds | −0.0001 | −0.0001 | −0.0001 |
| | (0.0001) | (0.0001) | (0.0001) |
| Payer Mix | 0.389*** | 0.355*** | 0.413*** |
| | (0.033) | (0.043) | (0.031) |
| LOS | −0.012*** | −0.012*** | −0.013*** |
| | (0.003) | (0.003) | (0.002) |
| Year | Significant | Significant | Significant |
| Constant | −0.0001 | −0.0001 | −0.0001 |
| | (0.0010) | (0.0010) | (0.0009) |
| Observations | 18,059 | 18,059 | 18,059 |
| $R^2$ | 0.19 | 0.22 | .23 |
| *p*-value | 0.00 | 0.00 | 0.00 |
| Number of IVs added | 4 | 8 | 6 |
| Number of IVs selected | 3 | 4 | 4 |

*Notes.* Instruments: The percentage of hospitals in a state with an OPX and vote share difference between republicans and democrats in the county served by a hospital as an instrument for duration of OPX; The unemployment density and wage index are used as instruments for CMI. IV using PDS selected variables

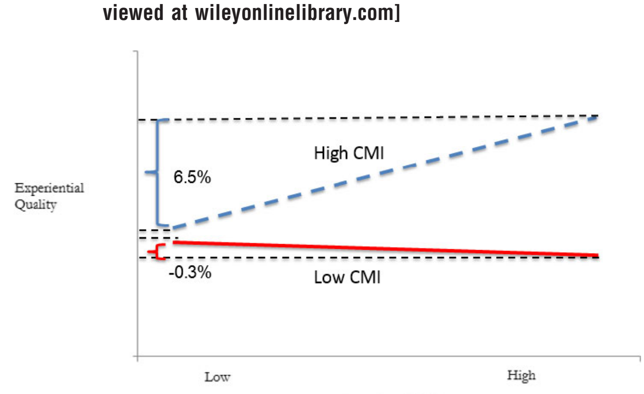
Model 1 Selected Instruments: OPX Bandwagon, Wage Index and Unemployment Density
Model 2 Selected Instruments: OPX Bandwagon, Wage Index, OPXBandWagon × WageIndex, VoteSplit × WageIndex
Model 3 Selected Instruments: OPX Bandwagon, Wage Index, ResidenttoBed × OPXBandWagon, ResidenttoBed × VoteSplit
(2-sided test) ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

H1 argues that the duration of OPX will improve hospital performance on EQ. As seen in Table 2, the coefficient for duration of OPX is positive and significant ($\beta = 0.078$, $p < 0.05$), indicating its positive effects on EQ and providing support for H1. This translates into a 1.95% increase in raw EQ scores (compliance percentage—$P_i$) for hospitals with an OPX as its length of operation increases by 1 year.

H2 suggests that with increase in CMI, the effectiveness of the OPX in improving EQ will increase with its duration. As seen in Table 2, the coefficient of the interaction term between duration of OPX and CMI is positive and significant ($\beta = 2.98$, $p < 0.05$). To better understand these interaction effects, we created a conditional effects plot that illustrates the relationship between CMI and EQ, as shown in Figure 2. The results indicate that for hospitals with high CMI (75th percentile) the EQ scores (compliance percentage—$P_i$) increase by 6.5% with 1 year increase in OPX operation. On the other hand, for hospitals with low CMI (25th percentile) the EQ scores (compliance percentage—$P_i$) decrease by 0.3% with 1 year increase in OPX operation. These results offer support for H2.

H3 suggests that the effectiveness of the OPX in improving EQ will increase as the resident intensity at the hospital increases. As seen in Table 2, the coefficient of the interaction term between duration of OPX and resident intensity is positive and significant ($\beta = 5.08$, $p < 0.1$). To better understand these interaction effects, we created a conditional effects plot that illustrates the relationship between resident intensity and EQ, as shown in Figure 3. The results indicate that for hospitals with high resident intensity (75th

**Figure 2 Interactions Plot for the Relationship between Duration of OPX and CMI for Experiential Quality [Color figure can be viewed at wileyonlinelibrary.com]**



percentile) the EQ scores (compliance percentage—$P_i$) increase by 1.8% with 1 year increase in OPX operation. On the other hand, for hospitals with low resident intensity (25th percentile) the EQ scores (compliance percentage—$P_i$) increase by only 0.9% with 1 year increase in OPX operation. These results offer support for H3.

### 4.2. Post hoc Analyses

Our engaged field work with HOSP1 and our interactions with administrators from other health care institutions enabled us to gather several interesting insights on the operating mechanisms around the OPX. We explore these insights using three distinct post-hoc analyses that offer important practical insights to the health care administrators.

**4.2.1. OPX and Its Impact on Operating Cost.** Given the effectiveness of an OPX in improving EQ over time, the question that is critical to the decision on whether to set up an OPX is its cost effectiveness. Our interviews with the administrators from HOSP1 suggested that hospitals recruit additional staff with different backgrounds (e.g., hospitality industry) to improve communication among the care providers. On the one hand, this may result in increased operating costs due to additional FTEs, while on the other hand there could be other benefits from consolidating the training programs for caregivers and resulting improvements in EQ. Such outcomes can not only increase reimbursements from CMS but also improve patient outcomes due to more effective patient-caregiver communication. Moreover the cost of operating the OPX can also change as a function of its length of operations.

As a post hoc analysis, we explore the relationship between duration of OPX and operating cost to obtain additional insights on the practical value of this office. We used an instrumental variable fixed effects regression model using LASSO for instrument selection to determine the cost effectiveness of setting up an OPX. Cost effectiveness is measured using operating cost that includes expenses incurred in every aspect of a hospital's operations, including employee salaries, supplies, and administrative expenses. Hence this variable is a good proxy to measure the cost impact of setting up and running an OPX. Consistent with the prior literature, we divided operating cost by the number of beds to normalize it for size (Sharma et al. 2016). A natural log of cost per bed is used for the study. We apply a log transformation to the measure to reduce the impact of outliers. Table 3 provides the results of the fixed effects instrumental variable regression model.

As seen in Table 3, the coefficient for the duration of OPX ($\beta = -0.185$, $p < 0.10$) is weakly significant and associated with operating cost, suggesting that the duration of OPX is associated with lower cost of

**Figure 3 Interactions Plot for the Relationship between Duration of OPX and Resident Intensity for Experiential Quality [Color figure can be viewed at wileyonlinelibrary.com]**

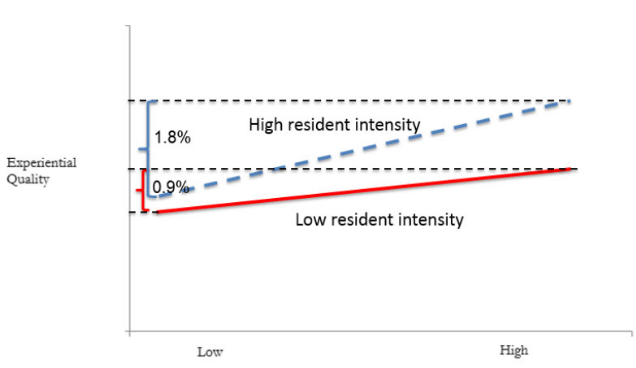



**Table 3 Fixed-Effects Instrument Variable Regression Model for Cost Using LASSO for Instrumental Variable Selection**

| | Cost | | |
|---|---|---|---|
| | Model 1 | Model 2 | Model 3 |
| Duration of OPX | −0.185*** | −0.312* | −0.225*** |
| | (0.057) | (0.181) | (0.062) |
| CMI | 0.204 | −0.424 | 0.052 |
| | (0.672) | (0.760) | (0.635) |
| Resident Intensity | −0.004 | 0.046 | 0.008 |
| | (0.074) | (0.103) | (0.076) |
| Duration of OPX × CMI | | 0.794 | |
| | | (1.118) | |
| Duration of OPX × Resident Intensity | | | 0.914*** |
| | | | (0.304) |
| Beds | −0.002*** | −0.002*** | −0.002*** |
| | (0.000) | (0.000) | (0.000) |
| Payer Mix | −0.142** | −0.134** | −0.152 |
| | (0.068) | (0.063) | (0.069) |
| LOS | 0.013** | 0.012** | 0.011** |
| | (0.004) | (0.004) | (0.004) |
| Year | Significant | Significant | Significant |
| Constant | 13.34 | 13.34 | 13.34 |
| | (0.001) | (0.001) | (0.001) |
| Observations | 19,273 | 19,273 | 19,273 |
| $R^2$ | 0.52 | 0.53 | 0.52 |
| $p$-value | 0.00 | 0.00 | 0.00 |

*Notes.* Instruments: The percentage of hospitals in a state with an OPX and vote share difference between republicans and democrats in the county served by a hospital as an instrument for duration of OPX; The unemployment density and wage index are used as instruments for CMI. IV using PDS selected variables

Model 1 Selected Instruments: OPX Bandwagon, Wage Index and Unemployment Density
Model 2 Selected Instruments: OPX Bandwagon, Wage Index, OPXBandWagon × WageIndex, VoteSplit × WageIndex
Model 3 Selected Instruments: OPX Bandwagon, Wage Index, ResidenttoBed × OPXBandWagon, ResidenttoBed × VoteSplit
(2-sided test) ***$p$ < 0.01; **$p$ < 0.05; *$p$ < 0.1.

operations. This effect translates into a 1.4% reduction in the operating cost for 1 year increase in OPX operations. The interaction between duration of OPX and CMI is insignificant, indicating that cost efficiencies realized by an OPX are not dependent on CMI of patients treated at the hospital. The interaction between OPX and resident intensity turns out to be significant ($\beta = 0.914$, $p < 0.01$) indicating differential benefits based on the strength of the residency program at a hospital. However, the differences in effect sizes turn out to be insignificant between hospitals with higher resident intensity (1.6% cost reduction) and hospitals with lower resident intensity (1.7% cost reduction).

**4.2.2. Investigating the Benefits within EQ Dimensions.** Although the duration of OPX is effective in improving EQ for hospitals with higher CMI and resident intensity, its impact may vary for different aspects of EQ. Following Senot et al. (2015) we divided EQ into two dimensions—*response-focused EQ* and *communication-focused EQ*. According to Senot et al. (2015), response-focused EQ is comprised of tasks (referred to as behavioral tasks) that are more standardized in specifications and have a tangible outputs. This dimension is comprised of two HCAHPS scales: (i) How often did patients receive help quickly from hospital staff? and (ii) How often was the patient pain controlled? The communication-focused EQ dimension is comprised of tasks (referred to as conceptual tasks) that require a greater reliance on the ability of a caregiver to interpret the preferences and requirements of patients and structure a response accordingly, thus making the output of these tasks more intangible. This dimension is comprised of four HCAHPS scales: (i) How often did doctors communicate well with patients? (ii) How often did nurses communicate well with patients? (iii) How often did staff explain about medicines before giving them to patients? and (iv) Were patients given information about what to do during their recovery at home?

Response-focused EQ and communication-focused EQ are conceptually distinct constructs, nevertheless, there is a high correlation between them. This high correlation could be because a single patient provides ratings on both these measures. A halo effect created due to good communication between the patient and caregivers could confound the ratings given by the patient on response-focused EQ, resulting in a high correlation between them. In order to rectify this issue we used sequential regression (Hastie et al. 2009, Nagar and Rajan 2005, Ridker and Henning 1967, Sine et al. 2003) to test the impact on an OPX on these aspects of EQ. This is a commonly used approach when dealing with correlated variables—for example, Senot et al. (2015), also used this approach to resolve the high correlation between communication-focused EQ and response-focused EQ. Sequential regression involves keeping one of the correlated variables as is and regress the other one against it. The predicted residuals from this regression are then used to represent the second variable. This approach assigns the common variance between the correlated variables to one of them—in this case communication-focused EQ. The orthogonal construct for response-focused EQ then captures its score attributed to factors other than communication-focused EQ. Communication-focused EQ and the orthogonal construct for response-focused EQ are then used in an instrument variable fixed effects regression model using LASSO for instrument selection to test the hypothesis. The results are presented in Table 4.

As seen from Table 4, the interaction between CMI and duration of OPX for both the dimensions of EQ are significant, demonstrating consistency with the main analysis. The results indicate that for hospitals with high CMI, the communication-focused EQ scores (compliance percentage—$P_i$) increase by 1.6% with 1 year increase in OPX operation, whereas a 0.3% increase is observed for hospitals with low CMI. For response-focused EQ scores (compliance percentage —$P_i$), a 3.6% improvement is observed for hospitals with high CMI and 1 year increase in OPX operation, whereas a 1.5% improvement is observed for hospitals with low CMI. Thus, for high CMI hospitals an OPX has a large impact in improving response-focused EQ when compared to communication-focused EQ. This result suggests that having an OPX has a stronger association with improving tangible aspects of quality (response-focused EQ) compared to intangible aspects of quality (communication-focused EQ).

With regard to hospitals with high resident intensity, the communication-focused EQ scores (compliance percentage—$P_i$) increase by 2.0% with 1 year increase in OPX operation, whereas a 0.3% increase is observed for hospitals with low resident intensity. Similarly, for hospitals with high resident intensity, response-focused EQ scores (compliance percentage —$P_i$) increase by 1.2% with 1 year increase in OPX operation, whereas a 0.1% increase is observed for hospitals with low resident intensity. This result suggests an OPX has a stronger association with improving communication-focused EQ for hospitals with high resident intensity, compared to response-focused EQ. This is along expected lines as residents are primarily involved in care delivery and not in activities that improve responsiveness to patient needs—which falls under the purview of nurses and support staff.

**Table 4 Fixed-Effects Instrument Variable Regression Model for Different Dimensions of Experiential Quality Using LASSO for Instrumental Variable Selection**

| | Communication-focused EQ | | Response-focused EQ | |
|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 |
| Duration of OPX | 0.051 | 0.024 | 0.165 | 0.082 |
| | (0.095) | (0.058) | (0.141) | (0.082) |
| CMI | 0.469 | 0.029 | 0.807* | 0.644 |
| | (0.283) | (0.324) | (0.427) | (0.540) |
| Resident Intensity | 0.022 | −0.043 | 0.132 | 0.008 |
| | (0.051) | (0.062) | (0.078) | (0.091) |
| Duration of OPX × CMI | 0.750* | | 1.709** | |
| | (0.420) | | (0.816) | |
| Duration of OPX × Resident Intensity | | 1.816* | | 3.83** |
| | | (1.10) | | (1.77) |
| Beds | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| | (0.0001) | (0.0001) | (0.0001) | (0.0001) |
| Payer Mix | 0.017 | 0.024 | 0.078* | 0.080* |
| | (0.032) | (0.032) | (0.047) | (0.046) |
| LOS | −0.013*** | −0.012 | −0.033*** | −0.030*** |
| | (0.004) | (0.003) | (0.006) | (0.004) |
| Year | Significant | Significant | Significant | Significant |
| Constant | 1.074*** | 1.081*** | 0.509*** | 0.528*** |
| | (0.005) | (0.001) | (0.009) | (0.001) |
| Observations | 18,059 | 18,059 | 18,059 | 18,059 |
| $R^2$ | 0.28 | 0.07 | 0.32 | 0.09 |
| *p*-value | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of IVs added | 8 | 6 | 8 | 6 |
| Number of IVs selected | 4 | 4 | 4 | 4 |

*Notes*. Instruments: The percentage of hospitals in a state with an OPX and vote share difference between republicans and democrats in the county served by a hospital as an instrument for duration of OPX; The unemployment density and wage index are used as instruments for CMI. IV using PDS selected variables

Model 1 Selected Instruments: OPX Bandwagon, Wage Index and Unemployment Density
Model 2 Selected Instruments: OPX Bandwagon, Wage Index, OPXBandWagon × WageIndex, VoteSplit × WageIndex
Model 3 Selected Instruments: OPX Bandwagon, Wage Index, ResidenttoBed × OPXBandWagon, ResidenttoBed × VoteSplit
(2-sided test) $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

**4.2.3. Additional Insights from Interviews with OPX and Hospital Staff.** Interviews with OPX and hospital staff at HOSP1 also revealed that in addition to the setup of an OPX, the background of the CXO, medical vs. non-medical, could also impact its effectiveness. This hospital initially had a CXO with a non-medical background who faced challenges when working with the providers. Later on, he was replaced by a CXO with a medical background. Her specialty was cardiothoracic surgery. In the words of the current CXO:

> Patient experience in HOSP1 is everyone's responsibility. Putting it on one person is not an effective strategy. Our hospital is heavy on physician oriented culture and every department directly has to incorporate patient experience measures as a part of their performance metrics. That being said, we find that having someone with medical background lead this office does help gain trust and improve communication with the providers.

There is some support from the literature for this insight. Previous studies have shown that the characteristics of top executives are an important factor in explaining variance in organizational performance related to investments (Bertrand and Schoar 2003), financial disclosure (Bamber et al. 2010), and financial reporting (Ge et al. 2011). However, we find that there are opposing viewpoints explaining why CXOs with a medical and non-medical backgrounds could both be effective leaders in the health care industry context. According to the Upper Echelons theory (Carpenter and Sanders 2004, Hambrick and Mason 1984), senior managers can influence organizational outcomes through coordination mechanisms, incentive schemes, and formal planning mechanisms. Hambrick and Mason (1984) further argue that most of these execution decisions are primarily influenced by the leaders' cognitive base and values, which vary based on their education and professional backgrounds. When hospitals appoint CXOs with non-medical backgrounds, they typically bring in leaders from hospitality and service industries who have strong technical knowledge on improving patient experience. Thus the Upper Echelons theory supports the viewpoint that having a CXO with a non-medical background would help improve OPX effectiveness.

However, Social Identity theory (Hogg and Terry 2000) suggests that these individuals (i.e., with non-medical background) do not conform to the identities of the majority of the employees in the hospitals who have a medical background. This could make it difficult for a CXO with a non-medical background to gain buy-in from certain caregivers, particularly physicians, who are less likely to conform to formalization structures and will have weak social identity with the CXO (Cosgrove 2014). In contrast to experiencing such organizational balking, a CXO with a medical background will have a better understanding of caregiver dynamics. Because of this, she or he is likely to receive less organizational pushback. Specifically, having a medical background will provide the CXO with the credibility to initiate new process and cultural changes that will have a long-term impact on improving EQ. Thus, Social Identity theory argues that caregivers are more likely to support improvement initiatives that are led by a medical CXO due to positive social identity reinforcement (Hogg and Terry 2000).

Due to the cues from our interviews but inconsistent evidence from literature, we decided to explore this relationship as an additional post hoc analysis. To test this relationship we collected CXO background information for the head of the OPX in 2014. There were 21 CXOs with a medical degree and 104 CXOs with non-medical degrees, while the background for 5 CXOs could not be ascertained. The common non-medical degrees include PhD, MBA, and MHA while 7 of the 21 CXOs were physicians (MD or DO) and the remaining had a nursing degree (RN). We tested the impact of the CXO background on the effectiveness of OPX using a fixed-effects regression model. The results of the fixed effects model are presented in Table 5.

The interaction between duration of the OPX and CXO background is positive and significant ($\beta = 0.081$, $p < 0.01$), indicating that an OPX with a medical CXO realizes greater improvements in EQ. This translates into an EQ improvement of 1.6% for a hospital with a medical CXO, compared to EQ improvements of 0.1% for a hospital with a non-medical CXO. This result supports the cues from our interviews and the insights from the Social Identity theory. However, given the small sample size of the analysis, we urge future scholars to further investigate this important research question regarding the background of leaders on the effectiveness of similar administrative innovations.

**Table 5 Fixed Effects Regression Model to Study the Impact of CXO Background on Experiential Quality Performance**

| | Experiential quality |
|---|---|
| Duration of OPX | 0.003 |
| | (0.014) |
| CMI | 0.094*** |
| | (0.014) |
| Resident Intensity | −0.037 |
| | (0.046) |
| CXO Background (Base: Non-medical CXO) | |
| Medical CXO | −0.015 |
| | (0.039) |
| No OPX | −0.004 |
| | (0.015) |
| Duration of OPX × CXO Background | |
| Medical CXO | 0.081*** |
| | (0.025) |
| Beds | −0.0001 |
| | (0.0001) |
| Payer Mix | 0.068** |
| | (0.026) |
| LOS | −0.012*** |
| | (0.002) |
| Year | Significant |
| Constant | 0.875*** |
| | (0.022) |
| Observations | 20,331 |
| $R^2$ | 0.34 |
| *p*-value | 0.00 |

*Notes.* (2-sided test) ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

### 4.3. Robustness Checks

We conducted several additional analyses to ensure the robustness of our analyses—all results are presented in Online Appendix B. First, we present results from an instrumental variable fixed effects regression model without using LASSO to select instruments. The results from this analysis again remain consistent in directionality and effect sizes to the main analysis. Second, we use a difference in EQ with respect to the base year as an alternate dependent variable to test our hypothesis. This is done to eliminate the effect of any time varying factors that could be impacting EQ but were not accounted for in the model. We use an instrumental variable fixed effects model using LASSO to select instruments to test the hypothesis. The results remain consistent with the main analysis in directionality with lower effect sizes.

Finally, as an additional robustness we used an alternate measure of EQ to test our hypothesis. Specifically, we conducted a Confirmatory factor analysis (CFA) to assess the convergent validity for the EQ scale items and then used the resulting factor score to test the hypothesis. The fit indices for the CFA model were within recommended specifications (RMSEA = 0. 149; CFI = 0.964; SRMR = 0.023) indicating good model fit. All the path coefficients from the constructs to their scale items were significant ($p < 0.01$) and ranged from 0.73 to 0.98 providing strong evidence for convergent validity. We use an instrumental variable fixed effects model using LASSO to select instruments to test the hypothesis. The results remains consistent with the main analysis.

## 5. Discussion and Conclusions

### 5.1. Implications for Theory

This research has several contributions to the literature that are worth mentioning. First, we offer empirical evidence supporting the efficacy of administrative innovations such as OPX in the health care industry for improving EQ. Although, reimbursement changes have mandated hospitals to improve EQ, these measures are often viewed as 'bonus' by caregivers and are mostly treated with lower importance when compared to clinical and patient safety outcomes (Boulding et al. 2011). Hence improving this metric requires a cultural transformation within the organization and adoption of a new model of health care delivery which is centered around the patient. Unfortunately, the health care industry faces significant cultural transformation challenges due to the power differences among physicians, nurses and other personnel (e.g., social workers) who are affected by these innovations. We find limited evidence in the health care operations and public health literature on whether formalization structures such as OPX would help improve EQ over time. Our research addresses this gap and demonstrates the efficacy of these offices in driving cultural transformation and improving EQ outcomes. That is, increased length of operation for these offices is indeed associated with the hospitals improving on EQ scores. When comparing the general trends in EQ for all acute care hospitals with those having an OPX, we find that during our 8 year study period hospitals having an OPX had a 1.95% average annual improvement in EQ when compared to only a 0.85% annual improvement for hospitals that did not have this separate structure. The latter estimate (i.e., 0.85%) is based on an average annual change in EQ for hospitals without an OPX, determined independent from the main analysis. This reinforces our claim that having additional resources and staff can indeed help hospitals improve at a stronger rate when compared to these initiatives being headed by the office of quality and safety.

Second, we demonstrate that process variability during care delivery, both from the patients (measured through CMI) and providers (measured through resident intensity), are important factors in determining the effectiveness of OPXs. Previous research has argued that increase in process variability could dampen the effectiveness of new innovations due to coordination challenges (Campbell and Frei 2011, Damanpour 1996, Lang et al. 2014). In contrast to these studies, we find that the strength of the relationship between the duration of OPX and EQ becomes stronger with an increase in the process variability. This is because with increase in time and commitment from the hospitals, OPXs can offer the much-needed organizational support through additional staff and training that can help manage higher information processing challenges associated with these settings (Weigelt and Sarkar 2012). Insights from HOSP1 also support this finding, revealing that hospitals get better in designing training interventions under these offices and hence sustained commitment to these offices does help in improving EQ.

Our post hoc analysis reveals that setting up a new administrative entity is also a cost effective endeavor for hospitals, with hospitals witnessing lower operating costs with increase in the duration of OPX. We also find that these cost benefits are not impacted by CMI but have a small negative impact due to resident intensity. Overall our results may suggest that cost-quality tradeoffs (e.g., Senot et al. 2015) documented in health care may not be present when setting up these offices. The reductions in operating expenses are likely due to increased efficiencies in execution of trainings and interventions to improve EQ, improved clinical outcomes due to more effective patient-caregiver communication and an increase in patient volumes due to higher patient satisfaction and word of mouth marketing. Hospitals operate on thin margins—the median operating margin for hospitals in 2018 was 1.7% (Kacik 2019). An initiative which improves EQ while reducing operating expenses presents a lucrative opportunity for hospitals. In addition to these findings, we provide more granular details regarding the impact of OPX operations. Specifically, we find that an OPX is effective in improving both response-focused EQ and communication-focused EQ for hospitals which have higher CMI, with a larger improvement observed for response-focused EQ. In contrast, hospitals with higher resident intensity benefit through a bigger improvement in communication-focused EQ compared to response-focused EQ. Prior studies on EQ have grouped different dimensions into an aggregate score (Chandrasekaran et al. 2012). By demonstrating the differential impact on different aspects of EQ we highlight the importance of disaggregating this measure in future studies.

Finally, our study also finds support for the claim that the background of the leader of an OPX—namely the CXO—has an impact on the effectiveness of this office. Previous studies on Upper Echelons theory (Carpenter and Sanders 2004, Hambrick and Mason 1984) suggest that senior leaders' professional backgrounds can affect organizational performance through several control mechanisms and incentives. Hence, a non-medical CXO with technical knowledge of customer experience might be better equipped to lead these entities. However, there is also evidence of the importance of the leader (i.e., CXO) having similar social identity to other agents (i.e., caregivers) when initiating changes in these environments. Results from our analyses suggest that the social identity provided by a medical CXO dominates the higher technical capabilities (provided by a non-medical CXO) in the health care industry context characterized by higher power differences.

### 5.2. Implications for Practice

Our study has important implications for health care administrators. First, we demonstrate that an OPX is effective at improving overall EQ. When hospitals do not have this office, EQ is usually handled by the Office of Quality and Patient Safety, which already has other goals such as reducing preventable medical errors and hospital acquired infections. Hence, projects that work toward improving EQ receive less priority under these conditions. As a result, our recommendation is for hospitals to invest in the creation of these independent entities. We believe that having these offices will help better coordinate care not just within a hospital but between hospitals and outpatient entities, an activity that is becoming increasingly vital for health care delivery in the United States (Lynn et al. 2015). Having this office also provides hospitals the capability to hire full-time employees from other industries that can help train providers on communication oriented tasks. In HOSP1, we found that the medical CXO hired about 10 FTE from hospitality industry who worked in conjunction with 10 other employees with nursing backgrounds. This diverse workforce was capable of working with rest of the providers in patient experience initiatives. However our study also finds that the efficacy of these innovations may be dependent on organizational characteristics (e.g., degree of process variability). Organizations need to carefully evaluate these considerations before making the upfront investments to support these innovations.

In addition, our study suggests that hospitals investing in an OPX may be better served by appointing a CXO with a nursing or medical degree (i.e., medical CXO) than a non-medical CXO. While it is reasonable to staff these offices with non-medical employees with abundant experience on customer facing operations, having a leader who has a medical background can allow these offices to lead difficult cultural and procedural changes that will have a lasting impact on the hospital. Interestingly, we find that a vast majority of hospitals have non-medical individuals leading these offices. Results from our study suggest that when hospitals have a medical CXO leading these entities, they may demonstrate greater improvements in EQ. This may be due to less resistance from the caregivers given their common social identity when improving communication with the patients.

### 5.3. Implications for Health Care Policy

Our study also has some important insights to the value-based purchasing reimbursement policies implemented by CMS. Currently, CMS uses the HCAHPS survey that are distributed to patients after discharge to measure both the response-focused and communication-focused dimensions of EQ. CMS also places similar weights on both these dimensions when calculating the reimbursement dollars. This approach to measure and weigh EQ has come under a lot of criticism by health care researchers (e.g., Jha et al. 2008). In fact, a study by Lee et al. (2010) looking at EQ surveys found that not all dimensions of HCAHPS are valued equally by the patients and combining them together may not adequately capture the patient's voice on their hospital experience. Given our findings that there are different drivers to response-focused and communication-focused EQ, we also echo Lee et al. (2010) recommendations on the need for a different strategy to evaluate EQ. Specifically, one possible path is for the CMS to prioritize interpersonal elements of EQ by placing different weights to the communication-focused and response-focused dimensions when calculating reimbursement awards and penalties under the value-based purchasing.

Finally, improving patient experience measured using EQ is becoming a strategic priority for hospital administrators around the world, with countrywide ratings on patient centered care being released by agencies like the commonwealth fund and World Health Organization (Davis et al. 2014). Despite this positive trend, best practices on how to improve on this metric are still elusive. For example, Groene et al. (2015) is a study of 6536 patients from seven different countries concluded that there is a lack of consistent and effective strategies to implement patient centered care. Formalization structures, like an OPX, could prove to be effective in generating and implementing such best practices in other countries as well. In addition, this research could help policy makers in these countries to realize the differences between different aspects of EQ.

## 6. Limitations and Conclusions

We acknowledge the following limitations in our study. First, our measures of EQ are based on the HCAHPS survey, which may not adequately capture all types of caregiver–patient interactions. Recent studies show that EQ measured at the hospital level is associated with readmission rates and hence may serve as a good intermediate measure. CMS also uses EQ measures to calculate value-based reimbursement payments to hospitals and hence studying it may be meaningful for hospital administrators. Nevertheless, we urge future researchers to examine more granular levels of data on patient–caregiver interactions. Second, our study on the OPX is exploratory and although we had a standardized process to collect data on OPX (with good reliability), we were unable to collect additional details regarding the number of employees, specific budgets etc. for the OPX. Though we had rich qualitative data from one hospital on their staffing models, budgets and specific training programs, we are unable to obtain such insights for all the hospitals in our study. Finally, our study is based on an early cycle of adoption of OPXs. In the recent years, there has been an increasing trend towards OPX adoption. Accounting for the more recent adopters could provide insights on the motivators of late adopters and whether they influence OPX effectiveness. A longer panel may also enable testing of curvilinear effects and identification of the point of diminishing returns for these offices. These details may result in additional insights on factors impacting the effectiveness of the OPX which can be an extension of our current study. Finally, we acknowledge our limitations from the estimation approaches. While we used theoretically sound instruments that were reduced using LASSO to improve estimation, we do acknowledge that this is not a perfect approach and we may not completely resolve endogeneity issues. We relied on both qualitative insights and other robustness procedures to gain confidence with our conclusions and encourage future researchers to conducted fine-grained analyses to validate our findings.

Overall, this study offers important insights for both theory and practice. From a theoretical perspective, we demonstrate that formalization of reporting and establishing accountability for the improvement of EQ through the OPX is effective in driving improvements. However, the effectiveness of the OPX is better justified for hospitals with higher process variability. From a practice perspective, we demonstrate that an OPX is a sound investment, especially for hospitals dealing with higher process variability. The presence of an OPX has a positive impact on the performance measure of EQ while also reducing cost. In addition, having a medical CXO will increase the effectiveness of an OPX.

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## Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

**Appendix A:** Field Study.
**Appendix B:** Robustness Checks.