

Perceptions of Service Quality: Evidence for the Validity and Inseparability of Customer
Reported Experiences and True Quality

by

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Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor
of Philosophy in the Department of
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ABSTRACT

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Abstract

Marketing researchers have long relied on customer perceptions of service encounters to represent the “true” underlying quality. Researchers and practitioners in healthcare, on the other hand, have long dismissed customer perceptions as a credible measure of service quality. We built a quality framework designed to address this fundamental question: are customer perceptions of service encounters unique, redundant, or wholly flawed measures of actual service quality?

We consistently show customer perspectives reflect a measure of service quality that is both unique from, and complimentary to, the competence with which a service is provided. In fact, we found the explanatory power of either single dimension of process care is completely dependent on the state of the other as they relate to service encounter outcomes. This latter finding may require both management and policy makers to rethink how they approach managing and incenting a balanced approach to investments in improving process care dimensions.

Our research also provides evidence of factors both within, and indirectly outside, the control of management in improving healthcare service quality. In addition, government administrators face a particularly challenging roll in the system; their own policies – whether too punitive or too generous – have the potential to institutionalize lower quality healthcare for the very populations they are most trying to protect.

Dedication

To my beautiful bride Kristine: I owe you one.

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1. Introduction

Service quality research has long been limited by a lack of tangible measures from which to gauge quality. As such, marketers have relied on customers to provide a valid [and often the only] measure of service quality received. The lack of tangible measures is in large part due to unique aspects of service encounters not common across other fields (such as manufactured goods), which have the luxury of more tangible, i.e. objective, measures of quality. But would our beliefs regarding the validity of customer evaluations be challenged if a service encounter could be simultaneously evaluated with an objective measure (unbeknownst to the consumer) as well as the customer perspective (based on cues other than the objective measures), against an *ex post* measure of ultimate service quality? Our research examines the validity¹ and role of the customer's perception of service quality congruent to objective measures of the service encounter. We find customers perceive not only a unique dimension of quality but one that interacts with science-based objective measures. Thus, research evaluating only a single dimension of service quality, either objective or customer perceived, is incomplete in its breadth and the estimated impact on ultimate service outcomes is likely biased.

Building on our initial customer perception findings, we develop a service quality framework with significant application to both management and policy makers

¹ Counter to marketers beliefs, popular sentiment in our field of study is that customer perceptions of service quality are at best redundant with objective measures, but more likely negatively related to "true" service quality

within the US healthcare industry, our chosen field of study. Although a great volume of marketing research has determined the relationship between customer satisfaction and the firm's financial performance (see Rust et al. 1995; Anderson et al. 2004; Tuli & Bharadwaj 2009), healthcare in the US is unique in that the firm typically receives direct payment from a source other than the customer. And with few exceptions (e.g. cosmetic surgery) higher service quality should lead to a *lower* likelihood of a customer's repeat business. Therefore, where with typical goods and services the customer's satisfaction, loyalty, and intention to spend may cause financial rewards for the firm - which the firm may reinvest in further quality initiatives - it may not be for our setting. We extend our initial model to consider the firm's ability to deliver service quality as it pertains to the source of payment for the service. We find that when not driven by market forces, service quality is endogenous to the makeup of the client base. This leaves open the possibility that quality in the healthcare system is pre-ordained by the firm's endowed customers, not necessarily by the actions of the firm's management. Payment policy based on measures of quality - without consideration of the customer base's impact on financial health of the firm - may lead to a vicious cycle of financial penalties that further cripple the firm's ability to engage in service quality improvement initiatives. However, if not done with care, implementing quality adjustments based on patient demographics would likely lead to system-wide institutionalized standards tiers, where lower quality care for the most vulnerable populations will be financially reinforced, not discouraged.

1.1 Customer Perceptions and Service Quality

Marketing researchers have studied service quality for decades, measured primarily through evaluations provided by the customer (Bolton and Drew 1991a; Cronin and Taylor 1994; Golder et al. 2012; Parasuraman et al. 1985; Parasuraman et al. 1988). The methods used in evaluating service level underscore that customers' perceptions of quality are accurate (Boulding et al. 1993). The lack of objective measures and reliance on customer feedback are largely due to the difficulties in evaluating service quality. Parasuraman et al. (1985) highlight three aspects that make measuring service quality unique relative to, for instance, manufactured goods. The first is intangibility. Services are performance based, therefore cannot be measured prior to their delivery. The second is heterogeneity. High labor intensive services – such as delivery of medical care or even education – suffer from non-uniform delivery. For example, at a single hospital a patient may face within doctor variance depending on when/what day they see the physician, and variance across doctors. And the third is inseparability. Quality occurs during the service delivery, typically in an interaction between the customer (e.g. patient) and personnel (e.g. doctor or nurse). The client therefore affects the process, making service quality dependent on the customer's input. This also means service quality cannot be evaluated completely separate of the customer's experience.

Quality of manufactured goods, on the other hand, can typically be measured through tangible aspects. Two common dimensions of product quality are manufacturing quality and design attributes (Garvin 1983; Griffen and Hauser 1993). Manufacturing quality measures the flaws of what was produced relative to some standard. Factory in-line defects or customer returns (i.e. “external defects”) are such measures of manufacturing quality. Design attributes are concerned with the product relative to either customer requirements or competitor products. For example, in a more-is-better category such as central processing unit (CPU) speed, the faster of two CPUs is higher quality, *ceteris paribus*. In either case, quality can be measured through a mathematical operator, such as a count or difference. Unfortunately, the unique nature of each service encounter makes global indicators such as “defects” difficult to monitor, as a defect to the customer is measured by individual expectation rather than a universal criteria. But if tangible measures were available for service encounters, how would the customer’s perception of quality relate to them?

Prior research has found customers’ perceptions of quality are, in fact, consistent with underlying objective quality. For example, Mitra and Golder (2006) found changes in customer perceptions of quality follow changes in objective quality, whether those changes are increases or decreases. Although it takes customers several periods to fully update perceptions of quality with reality (Bolton and Drew 1991a), results have pointed to some level of contemporaneous movement in objective and perceived quality

(Boulding et al. 1993; Boulding et al. 1999; Kamakura et al. 2002; Mitra and Golder 2006; Prabhu and Tellis 2000). However, most work tying perceptions of quality to tangible measures have been in the consumer product domain, where features or attributes can be objectively measured. The healthcare field, however, is unique in that the service encounter is measured by both objective (universal scientific measures) and subjective (customer perceptions of care) indicators, and can ultimately be traced to an *ex post* measure of service quality.

Prior marketing conceptual models of service quality have focused on how the customer forms an opinion, i.e. the dimensions of quality and how new information from the service encounter relates to some prior belief or expectation (Boulding et al. 1993; Brady and Cronin 2001; Dabholker et al. 1996; Gronroos 1984; Parasuraman et al. 1988; Rust Oliver 1994). However, if the customer's expectations are not in their own best interest, and the service provider does not meet their expectations, should that reflect poor service quality? For example, a student whose expectation is for no homework, or a patient whose expectation is for a specific drug or procedure to be prescribed. If the professor or physician does not meet those expectations, is it necessarily due to poor service quality? To address this question our efforts fall primarily on whether the formation of the customer opinion regarding service quality is *uniquely* correlated with quality after controlling for other tangible quality cues.

Although our research has begun to shift the dialogue in healthcare (Friedburg et al. 2012), the debate is far from over (see section 1.3.3).

1.2 Healthcare Service Quality

The measuring of healthcare quality has been a heavily researched topic for almost 50 years. After 20 years of research, Donabedian (1988, pg. 1743) noted, “As we seek to define quality, we soon become aware of the fact that several formulations are both possible and legitimate.” That perspective continues to this day, where researchers continue to see the measurement of quality in healthcare as non-standardized (Pronovost et al. 2007). Despite this, Donabedian’s (1966, 1978, 1988) conceptual model of healthcare quality is the standard in the field and most heavily cited. Its framework lays out three constructs of quality in causal fashion: structure, process, and outcome (Figure 1).



Figure 1: Donabedian 3-factor conceptual framework of quality

Structure pertains to all capital - human, physical, and cultural - that enable the delivery of care. Structure is necessary but not sufficient for the delivery of care (Campbell et al. 2000) and “is not an end in itself but rather a means to an end: high-

quality health care” (Krumholz et al. 2000, pg. 9). Therefore, structure is typically not the main focus of healthcare quality research (Gross 2012). Although some research exists (Bazzoli et al. 2007; Cleverly & Harvey 1992; Encinosa & Bernard 2005; Shen 2003), Krumholz (2000) noted a general absence of literature that examines the relationships between structure and the other two dimensions, process and outcomes.

Process is embodied and codified in clinical practice guidelines, often measured as adherence to standard procedures recommended for a patient’s condition. Process is the actual service delivery of care and is further broken down into two distinct dimensions: technical and inter-personal (Blumenthal 1996; Campbell et al. 2000; Donabedian 1988; Irvine 1992; Steffen 1988).

Technical care² refers to the application of clinical medicine to a personal health problem and is based in theory which has been tested for efficacy, and ultimately accepted as standardized care (Campbell et al. 2000; Donabedian 1978). Based on clinical evidence, technical care is widely viewed as a credible measure of service quality and is used often in empirical research (Jha et al. 2006; Ryan et al. 2009). From a service-quality dimension, it has the unique characteristic of being simultaneously universal and specific to the individual. For example, a patient diagnosed with a heart attack (individual) should receive certain care, such as aspirin or beta blockers (universal to all

² For the remainder of this paper, we define technical care in this fashion. This is not to be confused with other definitions of “technical care” in the marketing literature (e.g. Gronroos 1984; Brady and Cronin 2001) whose use of the term is similar to outcomes in our context.

heart attack patients). Unbeknownst to the patient (see credence issues in section 1.3.3), a physician who omits that aspect of care is delivering poorer service quality. Due to its clinically-tested ties to better patient outcomes and easy measurement, technical care has been the primary measure of delivered process quality in healthcare research.

Inter-personal care is the interaction between the patient and members of the health care system. The quality of inter-personal care, however, is given somewhat secondary status in the health field (Fenton et al. 2012) as a complementary – not primary - measure of service quality (Browne et al. 2010)³. Inter-personal care is measured through patient surveys, and has a far more limited role to date in healthcare service quality research than technical care. Our Chapters 2 and 3 provide an initial exploration of the validity and unique nature of customer perceptions in measuring service quality.

Finally, outcomes are intended to measure the health status of patients after the service encounter. Krumholz (2000, pg. 31) notes “Outcome measures used as quality measures should be measurable, sensitive to modifications in the structure and process of care, and practical to use.” There are many healthcare outcome measures (e.g. symptoms, quality of life/well-being, functional status, cost, post-care infections, risk-adjusted mortality and readmission rates, etc.), not all of which are suitable for

³ Policy makers view it differently and have elevated its status through compensation practices, but not without criticism. Within both the peer reviewed and popular literature, customer satisfaction remains a secondary measure of healthcare quality.

measuring the delivered service quality. There are concerns about using outcomes as quality measures because measurement often occurs some time after the point of care. The lag opens the possibility factors other than the care received during the service encounter explains the outcome (Clarke 2004; Gross 2012; Lorch et al. 2004). But validity concerns have been overcome through the volume of research indicating a link between process care and outcomes. The use of outcomes as a measure of healthcare quality, particularly those that are risk standardized and within 30-days of care, is embraced and encouraged by the Center for Medicare and Medicaid Service, the National Quality Forum, and the Agency for Healthcare Research & Quality. Outcome measures represent a physical manifestation of the service quality, measures often absent in most service sector fields commonly studied by marketers.

1.2.1 Expanding the Donabedian Framework

Our work presented in Chapter 4 expands the Donabedian framework by considering 5 dimensions the firm faces. Consistent with the 3-factor model (Figure 1), we include structure, process and outcomes. However, we reconsider the relation between structure and process. Rather than a causal relationship, we consider the physical capital aspect of structure to work alongside process care. Within process, we propose the two facets (technical and inter-personal care) have both direct and interactive effects on outcomes. Overarching both process and structure is the firm's financial health, indirectly affecting customer outcomes. In turn, the firm's financial

performance is driven by the make-up of the customer base, rather than say, customer satisfaction with the firm's service. Figure 2 presents our expanded model of quality.

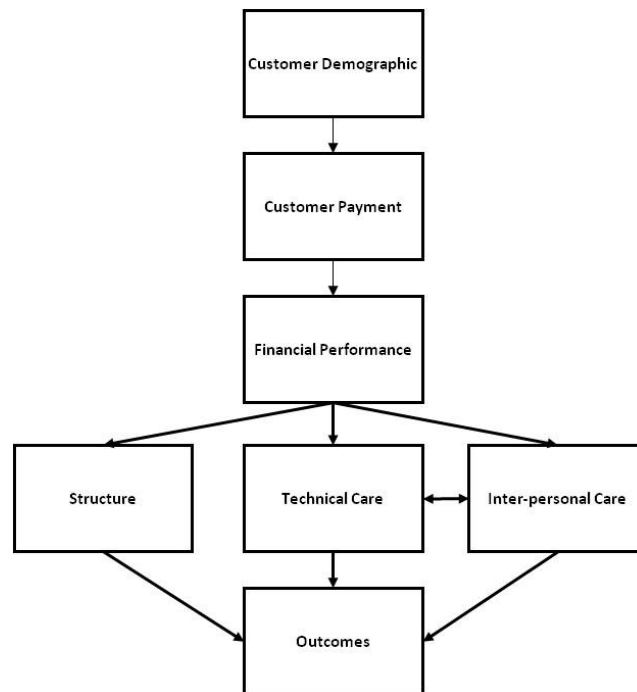


Figure 2: Super-model of hospital service quality

Although cultural elements of structure may influence/cause the delivery of process care, we delineate the physical assets from the culture. In isolation, physical assets are not likely to cause inter-personal care, or even many of the technical care measurements collected in the industry. For example, advanced surgical equipment may directly aid in better outcomes to patients, but its presence neither enables nor inhibits a physician from clearly explaining medication side-effects (inter-personal care) or a nurse

from administering an aspirin (technical care). Therefore, we posited physical assets (structure) have a direct effect on outcomes, rather than an indirect effect through process care.

Both elements of process care have received attention in the healthcare literature, including how technical care relates to outcomes (Bradley et al. 2006; Jha et al. 2007), how inter-personal care relates to outcomes (Jaipaul and Rosenthal 2003), and even on the relationship between inter-personal and technical care (Jha et al. 2008). However, according to Donabedian (1988, pg. 1744) “interpersonal process is the vehicle by which technical care is implemented and on which its success depends. Therefore, the management of the interpersonal process is to a large degree tailored to the achievement of success in technical care.” We define, and find evidence for, this relationship as an interaction of inter-personal and technical care in our formulation of quality as they relate to outcomes. Far from being redundant, inter-personal care captures both a unique and complimentary [to technical care] dimension of quality.

Delivering quality care - whether with adequate staffing levels, access to equipment, or knowledgeable and trained personnel – requires financial resources. Prior research has linked financial performance of hospitals to subsequent investments in plant and equipment, staffing, and process care initiatives (Bazzoli et al. 2004; Bazzoli et al. 2007; Duffy and Friedman 1993; Lindrooth et al. 2007). Others have found investments in structure and quality initiatives are correlated with outcomes (Cleverley

and Harvey 1992; Kuhn et al. 1991; Levitt 1994; Shen 2003). These prior findings give evidence for a causal flow from financial performance to outcomes through structure and process. Consistent with that, we found the financial health of hospitals Granger-caused technical care, inter-personal care, and investments in infrastructure.

If the consumption of healthcare was similar to fields already studied in marketing (e.g. more-is-better, competitive goods and services markets driven by consumer spending) then we could rely on prior conceptualizations of financial health that tie inter-personal care (i.e. customer satisfaction of the service) back to the firm's financial health to complete our model (Anderson et al. 2004; Gruca and Rego 2005; Rust et al. 1995; Tuli and Bharadwaj 2009; Wittal and Kamakura 2001). However, for healthcare providers such as US hospitals, direct payment is rarely from the customer. Rather payment is more often from an insurer, whether government (e.g. Medicare/Medicaid) or private⁴. The firm potentially receives a different payment level [for the same service] based on the payer. Payer mix has been reported to correlate with financial performance (Zuckerman et al. 2001) as well as outcomes and technical care (Culler et al. 2010; Goldman et al. 2007; Smith et al. 2013). Therefore, we incorporate payer mix into our model as directly impacting the firm's financial health, thus indirectly affecting structure, process, and outcomes.

⁴ In 2011, only 3.9% of patients at California hospitals were identified as "self-pay."

Healthcare quality and its relation with patient demographics has long been of interest to researchers and policy makers (Culler et al. 2010; Fiscella et al. 2001). Payer type and customer demographics, such as minority and elderly status with government payment programs, are highly correlated making the quality of care delivered to those groups of particular interest to policy makers (i.e. the payer). Given the strong relation and its particular interest to policy makers, we incorporate the customer demographics into our framework. Ultimately we find in the US healthcare system quality is pre-determined by the initial customer endowment.

With this framework in mind, we build on prior marketing research by bringing new insights into the customer's ability to identify a dimension of service quality that is not only unique, but complimentary to tangible measures of service quality as they relate to ultimate service outcomes. The interactive effect of technical and inter-personal dimensions also serve as warning to marketing researchers attempting to tie customer perceptions to quality measures. Failure to simultaneously control for competence of the service provider (i.e. technical care) may introduce an omitted variable bias problem. Our framework also contributes to the medical literature, first in legitimizing the customer's voice as a measure of quality in its own right, and second in understanding how the firm's ability to deliver quality is in large part tied to forces outside of its control. Policies that financially reward/penalize quality measures – even if risk-standardized - should factor in the indirect impact customer endowments have on

quality as they relate through financial performance. Otherwise, we provide evidence towards a long-term decline in service quality originating from a baseline financial status.

1.3 Field of Study: US Healthcare

Our field of study is the US medical industry, particularly acute hospital care. This field is ideal for marketing research for several reasons including the sheer magnitude and growth prospect of the industry, the unique data in the field, and commonly held beliefs that run contrary to marketing principals.

1.3.1 Healthcare Industry Background

Healthcare is the single largest service industry in the US representing roughly 17.9% of GDP, or \$2.7T, in 2011. Of that, hospital expenditures at the roughly 5,700 registered hospitals in the US⁵ represent the single largest component at \$851B. For perspective, hospital expenditures alone are almost equal to all US government spending (local, state, and federal) on all levels of education combined (\$851B vs. \$897B).⁶ Hospital expenditures are also projected to grow at a robust 5.7% CAGR over the coming decade (reaching 19.6% of GDP by 2021), keeping the healthcare industry firmly in the spotlight – or crosshairs - for the foreseeable future.

⁵ <http://www.aha.org/research/rc/stat-studies/fast-facts.shtml>

⁶ http://www.usgovernmentpending.com/year_spending_2011USbn_13bs2n#usgs302

Quality improvement – which can drive down system-wide costs/expenditures - is forefront in the minds of those managing the healthcare system. Their stated goal “...is to improve our ability to identify hospitals that can provide good outcomes at a reasonable cost while serving a broad spectrum of patients (including Medicaid) without driving up the overall volume of hospital and nonhospital services provided.” (MedPAC 2011, pg. 57) Yet the customer’s voice has been largely absent in the debate on how to reach higher service quality (and thus a less expensive system).

Despite the economic importance of the US healthcare service industry, and even modeling efforts by marketers (Brown and Swartz 1989; Nelson et al. 1992), marketing perspectives on the value of customer-based service quality measurement have received a slow reception. Physicians and researchers have been cautious – if not resistant - to adopt a marketer’s perspective of customer-based quality assessments of service. Over 15 years have passed since the New England Journal of Medicine ran a series “Quality of Health Care”, where Blumenthal (1996a, pg. 892) noted, “The view that consumers should have the information and other resources necessary to make judgments about the value of goods and services pervades all other sectors of our society and was bound to influence health care eventually.” Yet today health care operators and physicians alike continue to question both the clinical and business value of the customer experience in evaluating the quality of care provided (see section 1.3.3). Instead, the objective nature of clinical data, such as procedure adherence (technical care) and health status (outcomes),

has convinced some there is no need for customer opinions. Parasuraman et al. (1985) noted in the absence of objective measures, service quality should be evaluated by the customer. Medical researchers hold a tacit corollary to that which is in the presence of objective measures, customer feedback is unnecessary. But clinical data from the healthcare field provide marketing researchers a unique opportunity not available in other service industry settings. Universally accepted measures of technical care and post-service health status actually provide marketers the opportunity to test the customers' ability to measure service quality against observed and objective measures that reflect the received service quality. Thus service quality is not entirely latent, and we can gain insights into customers' abilities to accurately evaluate service quality.

1.3.2 Healthcare Data

Mitra and Golder (2006, pg. 236) noted, "The lack of suitable data has probably been the biggest obstacle to research on quality." Ironically, a field with relatively low confidence in customers perceiving service quality has data uniquely tailored to evaluate its legitimacy. The federal government collects multiple dimensions of service quality measures from thousands of hospitals on an annual basis. There are three primary measures of service quality available: the customer experience (satisfaction, i.e. inter-personal care), scientifically-based measures of service quality (i.e. technical care; actions care providers may undertake that through clinical trials are associated with better outcomes), and outcomes such as readmission and mortality, which are risk-

adjusted universally accepted measures of realized quality. The federal government also collects some aspects of financial health for the hospital. In addition, our research leveraged data collected within California, including customer demographic, payment sources, and a complete set of GAAP financials for each firm and year.

1.3.3 The Validity Debate of Customer Perceptions as Quality Measures in Healthcare⁷

There are popular beliefs within the medical field that run contrary to pillars of marketing. The primary one being customers not only lack the ability to identify good service quality, but instead they actually value service that is to their ultimate demise (i.e. customer satisfaction is associated with lower objective quality). The customer's instinct to weight their assessment of service quality on items that negatively impact "true" quality (as realized through outcomes) leads many to believe customer assessments should be completely ignored when evaluating the firm's - or individual provider's - service quality. Instead, healthcare has long relied on technical measures to determine service quality. Technical measures are based on scientific research that links a set of delivered care actions [i.e. service] with better patient outcomes (universally accepted measures of ultimate quality). It is in this light that medical researchers and practitioners have long questioned the need, or even the incremental value, of soliciting the customer for their perspective on service quality.

⁷ The basis of section 1.3.3 is published as Manary et al. (2013).

Our initial research focused on this specific topic, whether measures of patient's perspectives of their hospital experiences actually reflected the quality of the administered healthcare. Despite an increasing role of these measures in both research and policy there had been no consensus whether patient perspectives (often referred to as patient "satisfaction") legitimately measured delivered healthcare quality. In fact, as physician and hospital compensation has become increasingly tied to patient feedback, a chorus of healthcare providers and academics have raised strong objections to their use as an indicator of healthcare quality (Brown 2011; Haggerty 2010). These views are fueled by recent studies indicating patient satisfaction– at best – has no relationship with the quality of delivered healthcare, and at worst is actually associated with poorer patient outcomes (Fenton et al. 2012; Sequist et al. 2012). Conversely, our own research has shown patient perspectives not only positively associate with better health outcomes, but for some outcomes they are an even better indicator than healthcare provider adherence to clinical guidelines, i.e. technical care (See sections 3.2 and 4.2: Boulding et al. 2011). So what are patient perspectives; a legitimate measure of delivered service quality, fit for public reporting, research, and policy use, or a measure that incents healthcare providers to increase the cost of care with little or even negative impact on the well-being of customers? Our short answer, based on our own work and a critical review of the literature; when designed and administered appropriately, patient perspectives are a robust measure of delivered healthcare quality and efforts to measure

the patient experience in healthcare should be redoubled. We support this conclusion by addressing the three major concerns critics have with using patient perspectives as a measure of healthcare quality: credence, confounding, and prior expectations. This section concludes with an outline of broad issues in study design that may yield more consistent and informative results in patient perspective-based research.

The first concern goes as follows: Patients lack credence, or credibility, due to the absence of any formal medical training. Patients, therefore, cannot evaluate the quality of care they receive as they have no prior knowledge as to what is in fact good care (Blumenthal 1996; Bopp 1990). And given there are already universal measures in place to track technical quality (e.g. adherence to agreed upon treatment standards for certain medical conditions), an untrained customer's opinion is unnecessary.

Although patients do not possess technical medical knowledge, the credence argument fails to acknowledge that delivering healthcare is a service, and thus an accurate measure of quality (i.e. patient-centered care) in such a setting must account for the co-production of information generated by the patient and the service provider (Parasuraman et al. 1988). This is particularly important in healthcare since it is this interaction between patient and provider that produces part of the information (and thus knowledge) needed to provide high quality healthcare. For a simple example, consider the situation where a language barrier exists thereby making it difficult for the patient and physician to exchange critical information, instruction, and feedback that

ultimately plays out in the quality of treatment [and thus outcome] for the patient. Consequently, the service quality cannot be evaluated independent of the patient's experience, particularly if the patient is focused on evaluating the quality of the interaction with healthcare providers (and not the technical aspects of care). This is in line with Donabedian's (1988) distinction of two dimensions of health care quality, technical and inter-personal. Moreover, assuming patients in fact are asked to evaluate the inter-personal aspect of their experience, concerns over credence should be limited to the patients' lack of training in evaluating inter-personal communication and not their lack of medical training.

So, what do reported patient experiences actually measure? Chang and colleagues (2006) found in a primary care setting of elder adults that technical quality of care was not significantly associated with patients' overall rating of the care, indicating patients do not – or cannot - evaluate the technical quality of service. Lazare et al. (1975) also found patients provide positive overall assessments of service quality when their perceptions of process care are positive, even if the treatment was unsuccessful. In contrast, Jha and colleagues (2007) found in a hospital setting that overall customer satisfaction and the hospital's clinical adherence were positively correlated. One explanation for this is patients sense the quality of technical care around them, from which they largely base their satisfaction (these results and explanation rule out the credence concern). Another plausible explanation is that patients base their ratings on

good inter-personal care, which may be more likely observed when high-quality technical care is also received. And inter-personal care may represent a unique dimension of quality not fully accounted for by technical care.

But it could also be that patients incorporate – i.e. confound - some aspect not [directly] associated with process quality in the evaluation of their experience. For example, some believe that patients rate their satisfaction based on their health status; e.g. their post-care health status is poor therefore they report having poor healthcare experiences (Kravitz et al. 2005). But consider this: it is universally accepted that greater adherence to clinical standards is tied to better outcomes (Brook et al. 1996; Jha 2006; Jha et al. 2007; Hernandez et al. 2010; Nicholas et al. 2010; Werner and Bradlow 2010). If satisfaction is determined by the outcome, and outcomes are determined by greater adherence to clinical standards, then there should be no correlation between patient experience and outcomes after controlling for the quality of technical care and baseline health status. However, our studies (Boulding et al. 2011; Glickman et al. 2009) found a significant relationship even after controlling for these factors. This indicates patients are not simply reporting back their outcome which is due to technical care they received (ruling out the credence concern), but instead are reporting a unique dimension of quality not captured by clinical adherence alone (Chang et al. 2006; Sequist et al. 2008).

And what of superficial aspects (such as food quality or room decorations) encountered during care? A recent article in USA Today (Gluck 2011) inferred

significant increases in customer perceptions of quality could be achieved through investment in non-care related aspects, such as employing a “ukulele-playing greeter in Jungle Book-esque safari gear.” Even marketers have claimed as much, indicating when the primary service is hard for the customer to judge (i.e. the credence concern in healthcare), customers will base their satisfaction “on the little things” (Iacobucci et al. 1994, pg. 95), rather than the core service provided. Again, the results of our studies contradict this idea since overall satisfaction scores are associated with better outcomes even after controlling for technical care. If patient experiences were improving for non-care reasons, this association between patient perspective and outcomes would not exist. In addition, using two different survey instruments at two different time periods, we found patient ratings of room features and meals do not significantly influence overall satisfaction with hospital care after accounting for inter-personal care delivered by nurses and physicians. We take this as strong evidence that patient perspectives are capturing the quality of the co-production of knowledge needed to enhance the quality of medical care. That is, the interaction between the patient and the healthcare provider is an important determinate of the healthcare outcome and that patient perspective measures accurately reflect that quality.

Another oft cited concern is that patient perspectives reflect the level to which delivered healthcare meets their *a priori* desires/expectations, whether those desires are in the patient’s best interest or not. For example, patients may have a preconceived idea

of what drug or procedure should be prescribed and patients' perspectives reflect whether their primary care physician acquiesces to their requests (Fenton et al. 2012; Kravitz et al. 2005; Rao et al. 2000). But other research (Fisher et al. 2003) has found that for hospitalized patients, greater services ordered and higher spending did not correlate with higher satisfaction, an indication that those with high expectations of service fulfillment may not be rating service quality any higher when their wishes are met. And given extra patient-requested services do not lead to better outcomes (Kravitz et al. 2005), if patient satisfaction is tied to getting extra services, we would not have seen in our studies higher patient satisfaction relating to improved outcomes.

Across the three concerns in measuring patient perspectives, there are common threads in design and setting that separate those studies which find support for patient perspectives as a legitimate measure of service quality, and those that do not. The first is customer perspectives should be focused on a specific health event/visit as much as possible. In our review of the literature, when patient perspectives are measured on a specific hospital visit (e.g. through HCAHPS), they consistently tie well to universally accepted outcomes such as mortality and readmission, and across multiple service lines - even when hospital evaluations include patient perspectives from other service lines (Glickman et al. 2009; Boulding et al. 2011). In contrast, when general evaluations of health plans are used they tend to produce null to opposite effects (Fenton et al. 2012; Fisher et al. 2003; Mold et al. 2011; Sequist et al. 2012). One reason may be that health

plan surveys are ambiguous in terms of measuring the co-production of the service encounter, i.e. the particular instance of care. Instead they assess the total plan care over multiple care episodes (typically over a year or longer time period). This puts the onus on the customer to determine which interactions (and with whom) should factor in to their evaluation, leading to potentially noisy, fallible measures of the healthcare experience.

Second, patient experience survey instruments should focus on inter-personal care dimensions, and include evaluation of all their healthcare provider touch-points (e.g. nurses, blood work/testing staff, care coordination), not just physicians. When we analyzed the factors influencing overall satisfaction scores in hospital settings we found that aspects associated with nurses, pain management, and communication about medications are more predictive than interactions with physicians (Glickman et al. 2009). Interestingly, we found studies finding null, to negative, associations between satisfaction and outcomes used health plan surveys that only evaluated communication with the physician. However, in a second study we evaluated HCAPHS scores and found communication with physicians ranked only 5th out of 8 categories in correlating with overall satisfaction (Boulding et al. 2011). Therefore, relying on survey instruments that only capture a physician aspect of care produces an underdeveloped picture of patients' overall healthcare experience. This alone could give reason for many of the studies that find no relation between outcomes and patient perspectives.

Third, timeliness of the measures is important. In hospital visit studies (Boulding et al. 2011; Glickman et al. 2009), patient surveys are collected starting 2 days after discharge, and no later than 42 days after discharge; results are then adjusted for late/early responder bias. This is in keeping with the policy of the widely used American Customer Satisfaction Index's where consumers of services are surveyed within a month of their service provider interaction (Fornell et al. 1996). On the other hand, health plan and primary care physician surveys typically require patients to consider care given (i.e. service provider interactions) a year or more in the past, which can introduce considerable recall inaccuracies/bias (Aseltine et al. 1995; Litwin and McGuigan 1999).

And fourth, outcome measures should be risk adjusted and as closely related to the patient's interaction of interest as possible, both in time and effect (Krumholz et al. 2000; Krumholz et al. 2005). For instance, in Fenton et al.'s work (2012) the average duration between the measured satisfaction of primary care and their non-risk adjusted outcome measure (in this case mortality) is 3.9 years, a time-span that reduces sensitivity between process care and outcome (Krumholz et al. 2000). On the other hand, the referenced hospital studies measure risk-adjusted outcomes either while at the hospital or within 30 days of treatment. Having a standard and short duration between service event and outcome help eliminate possible confounding elements and allow the delivered care to directly influence the measured outcome (Krumholz et al. 2006). In addition, risk adjusting outcomes is necessary to eliminate alternative explanations. For

example, although Fenton and colleagues (2012) do attempt to control for comorbidity, their reliance on self-reported health status could introduce reporting bias (Blaxter 1985; Butler et al. 1987) that may explain their finding a positive association between satisfaction with primary care and mortality.

We recognize there are methodological issues related to the measurement and interpretation of patient experiences. However, we believe that both theory and the available evidence suggests patient perceptions are robust and unique indicators of the quality of healthcare, particularly when the patient interactions with the institution's multiple healthcare providers are measured temporally close to the interactions. This holds regardless of whether or not the surveyed patients [for an institution] are directly connected to the studied outcome measure. Therefore, the ongoing debate should not center on whether patients can provide a meaningful measure of healthcare quality, but on how to 1. improve the patient experience by focusing on activities (i.e. care coordination) most likely to lead to better health outcomes, 2. develop more robust measures of the patient experience, and 3. improve data collection procedures that link these measures with health outcomes. This is particularly true in situations where it is possible to link a specific patient's experiences, the specific service provider associated with that patient, and the patient's outcome without introducing bias or confounding factors.

1.4 Introduction Summary

Although accepted in marketing as a reliable measure of actual service quality, there is no direct evidence that customers can – and do - in fact assess the true underlying quality of their service encounters. This largely stems from a lack of objective quality measures to which customer perceptions can be tied. One field of exception is the US healthcare industry, where service encounters are measured through objective criteria, both during the service encounter and after, as well as by the customer. Unlike their marketing counterparts, health care researchers have come to largely reject the customer's voice as reflecting relevant quality, and instead rely almost wholly on objective measures that are scientific in nature. Chapters 2 and 3 address this initial, and fundamental, question: do customers' perceptions of service quality provide a significant and unique dimension of service quality?

Chapter 4 expands the framework and analysis of the prior chapters. It begins by considering the antecedents to customer service, in particular the role of finances, payer mix, and customer demographics in determining service quality. It also examines the relation between competence and caring, i.e. the interaction of the technical dimension of a service encounter with the inter-personal aspect as they both relate to the ultimate outcome. And finally, we consider the longitudinal effects of financial health on a hospital's future relative performance in multiple service quality dimensions.

Last, Chapter 5 combines survey results and publicly available performance data to identify the ways management can improve customer service through operational choices and organizational characteristics associated with customer perceptions of quality.

We note that although some of our results will be targeted for marketing publications, the majority of our research is/has been targeted for healthcare publications. Therefore each chapter follows the standard layout found in healthcare journals.

2. Customer Perceptions of Quality: Unique, Redundant, or Harmful Measures?¹

Our initial research laid out in chapters 2 and 3 examined the relationship of customer-provided perceptions of inter-personal care and outcomes, after controlling for the delivered technical care. Prior to this work, there was nothing in the literature that examined the customer's perception of quality after controlling for technical competence of the service provider. However, this was not due to a lack of interest in the topic. Opinions ran strong in some camps that the customer's voice was - at best - redundant to technical care, and even worse, associated with poorer outcomes. Despite that, a large number of hospitals began routinely using patient satisfaction surveys to assess the quality of care (Barr et al. 2002; Barr et al. 2006; Press I. 2006; Turnbull and Hembree 1996). In addition, in 2002 the Centers for Medicare and Medicaid Services (CMS) began developing a national, standardized survey instrument and data collection methodology for measuring patients' perceptions of their hospital experiences; this instrument is called the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey and was implemented in 2006 (CMS 2008; Darby et al. 2005; Goldstein et al. 2005). The first set of HCAHPS data was made publicly available in March 2008, and the original purpose of the data was to enable consumers to make comparisons of patient experiences across hospitals.

¹ The basis of Chapter 2 was published as Glickman et al. 2009.

Despite the growing popularity and implementation of patient satisfaction surveys, important questions remained about the use of customer satisfaction data to assess healthcare quality. As discussed in Chapter 1 these questions included the following: Do customer perspectives provide valid information about the medically related quality of hospital care, and if so, is it independent information on the overall quality of patient care beyond that obtained from the more accepted clinical performance measures? Are hospitals that have higher levels of patient satisfaction more likely to also produce better health outcomes? Which hospital experiences best account for patients' overall satisfaction? These questions formed the basis of our initial research framework tying technical and inter-personal care with outcomes, highlighted in Figure 3.

To answer these questions, we explored the relationship between a hospital's overall patient satisfaction (inter-personal care) score, its overall technical care quality score, and its risk-adjusted inpatient mortality rate for patients with acute myocardial infarction (AMI; this is an outcome) using data from a clinical quality improvement initiative coupled with patient satisfaction survey data collected by an independent third party. Specifically, we examined whether 1) patient satisfaction is associated with the quality of cardiac care as measured by adherence to practice guideline recommendations (technical care), 2) whether inter-personal care (as measured by patient experience scores) is an independent predictor of a hospital's outcomes

(inpatient mortality rate for AMI), and 3) which aspects of a patient's interactions with a hospital's facilities and staff are the most important determinants of their overall satisfaction.

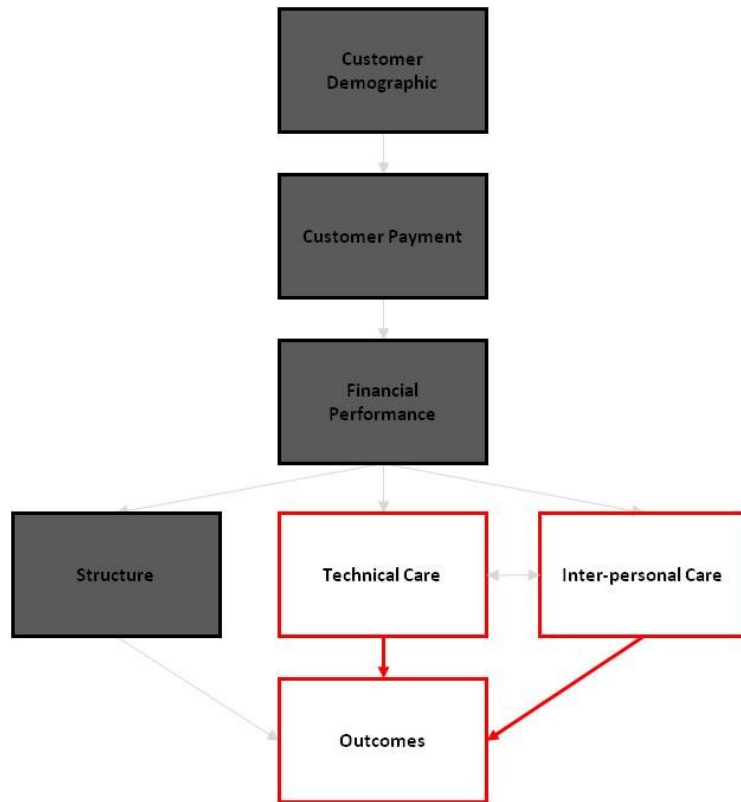


Figure 3: Chapter 2 and 3's framework relating customer satisfaction with outcomes after controlling for clinical guideline adherence during the service encounter

2.1 Methods

2.1.1. Data Sources

Quarterly technical care and patient characteristic information were obtained from the Can Rapid Risk Stratification of Unstable Angina Patients Suppress Adverse Outcomes with Early Implementation of the ACC/AHA Guidelines (CRUSADE) quality improvement registry (Peterson et al. 2006; Glickman et al. 2007; Staman et al. 2003; Shah et al. 2007; Hoekstra et al. 2002). CRUSADE centers collected and submitted clinical information regarding in-hospital care and outcomes of patients with non-ST-segment acute coronary syndrome with high-risk clinical features, including positive cardiac biomarkers or ischemic ST-segment electrocardiographic changes.

Quarterly inter-personal care data were obtained from patient surveys administered by Press Ganey Associates (South Bend, Indiana). Patients eligible to receive a survey included those discharged alive from the hospital, with the exception of patients transferred to another hospital using Press Ganey surveys and patients who had already been surveyed within the prior 30 days. Patients were surveyed within 1 week of hospital discharge. Only surveys for patients with cardiac diagnosis-related groups (DRG) were used for this study (including DRGs 121, 122, 124, 125, 140, and 143).

2.1.2 Study Population

Of the 568 hospitals that participated in CRUSADE between January 2001 and December 2006, we identified and contacted 110 hospitals that also collected Press

Ganey survey data sometime during the same period. Forty-five of these hospitals granted permission to use their inter-personal care data for this study. Using the hospital quarter as our unit of analysis, we first eliminated any quarterly inter-personal data from a given hospital for which we did not have at least 3 patient responses. Next, we matched the remaining quarterly observations across the 2 data sources and eliminated hospital quarters for which we did not have both technical and inter-personal care data. This yielded a total of 207 matched hospital-quarter observations from 29 hospitals. Finally, because we wanted to control for individual hospital effects in our analysis, we eliminated 4 hospitals for which we did not have at least 2 quarters of matched technical and inter-personal care data. These procedures reduced our relevant dataset to 203 quarterly observations at 25 hospitals.

2.1.3 Data Definitions

We calculated quarterly hospital-level technical care scores from the CRUSADE database for 14 different Class I evidence-based guidelines from the American College of Cardiology (ACC) and American Heart Association (AHA) guidelines for the treatment of AMI. We applied the same scoring method as used by CMS in the Hospital Quality Incentive Demonstration pay-for-performance program (Premier Inc. 2007), which is the percent of eligible encounters that received the recommended treatment as stated in the guidelines. Full compliance would result in a score of 100%. We then divided the 14 clinical processes into 3 categories (acute, discharge, and secondary prevention) and

calculated separate composite scores for each category using the CMS scoring method. We also calculated an overall hospital-level composite using all 14 measures. Patient eligibility for relevant measures was determined according to defined ACC/AHA guideline indications and reported contraindications. Patients who died anytime during their hospital stay or who were transferred to another hospital were excluded from discharge care assessment. Our outcome, in-hospital mortality, was defined as death from any cause during a patient's hospital stay within the relevant quarter. Inpatient mortality was adjusted for a patient risk score that was calculated by a logistic model including demographic and clinical characteristics previously identified to predict risk (Boersma et al. 2000).

The underlying inter-personal care included scores on 9 different dimensions of the hospital experience (nurses, personal issues, admission, physicians, visitors and family, discharge, meals, room, and tests and treatments) and 1 overall patient assessment of this experience. Unlike technical care scores which are specific to AMI related treatment, inter-personal scores are based on responses from service lines within the hospital including, but not limited to, AMI. Each of these 10 satisfaction scores was based on multiple questions for that aspect of the experience. The overall inter-personal care score was the average of 3 questions: "How well staff worked together to care for you;" "Likelihood of your recommending this hospital to others;" and "Overall rating of care given in a hospital." All questions were scored on a 5-point scale anchored by the

words “very poor” and “very good” and then converted to a 100-point scale where zero represented “very poor” and 100 represented “very good.” Quarterly averages for each hospital were obtained by averaging over all of the obtained surveys on that particular score. Thus, there is no direct link between a patient’s response and the clinical performance measure for that person. Instead our measures are at the hospital level associated with AMI activities.

2.1.4 Statistical Analysis

We follow the practice of medical journal reporting and first discuss the analyses performed without discussing the results. In the later section we present the results.

In order to gain some understanding of the relationship of our quarterly inter-personal measures, the 14 individual quarterly hospital technical care scores and outcome we compute pair-wise Pearson product moment correlation coefficients.

We used multivariable logistic regression to investigate whether inter-personal care was associated with outcomes after controlling for technical care. In each of these analyses, the dependent variable (outcome) was based on risk-adjusted inpatient survival (1 – mortality) for the particular hospital quarter. Consequently, hospital quarters with more outcome opportunities were weighted more heavily. The independent variables were based on the overall patient satisfaction score (inter-personal care) and composite guideline score (technical care) for each hospital quarter. We also used weighted least squares (WLS) linear regression, in which the dependent

variable was the proportion of surviving AMI patients, and obtained almost identical results. However, because the logistic regression results provide an easy way to compare the relative magnitude of improvement in survival due to changes in both inter-personal and technical care scores, we only report the logistic regression findings.

Next, we conducted the Durbin-Wu-Hausman test (Davidson and MacKinnon 1993) to determine if the inter-personal care measure was correlated with fixed, but unobserved, hospital effects such as hospital size and facilities, administrative expertise, and academic affiliation. We performed this test to determine whether it was necessary to control for such fixed effects in our analysis or if we could use the more efficient estimator obtained from an analysis excluding fixed effects variables (i.e., 25 hospital dummy variables among the other predictors). The Durbin-Wu-Hausman analysis was conducted by running a multivariate logistic regression with mortality as the dependent variable with the following 3 independent variables: the quarterly overall technical care score, the quarterly inter-personal care score, and the residual errors from an analysis of quarterly inter-personal care scores. The residuals come from an equation with inter-personal care as the dependent variable and 25 hospital dummy variables and quarterly overall technical care as independent variables.

We investigate the association of average answers to each of the individual survey sections (i.e., nurses, physicians, meals, etc.) with overall patient satisfaction

using a WLS model. The unit of analysis was the hospital quarter, and the weights reflected the number of patient surveys in the given quarter.

Finally, we performed analyses to ascertain whether our study population was representative of the larger Press Ganey and CRUSADE populations that were excluded from the study because we could not match data between the hospitals. We repeated the analysis for the relationship of overall satisfaction and the 9 different dimensions of patient satisfaction for the 262 hospital quarters of patient data that were excluded because we did not have equivalent hospital quarter clinical data. Additionally, we ran logistic regression where the dependent variable was the outcome (risk-adjusted inpatient mortality) and the independent variable was overall technical care for the excluded sample of 6082 hospital quarters for those CRUSADE hospitals for which we did not have matched patient satisfaction data. We compared the coefficients from these additional models with our study data using the Chow F test or the Wald test, depending on whether we used WLS or logistic regression (Chow 1960).

All analyses were performed using JMP v. 7.0.2 (SAS Institute Inc., Cary, NC). $P < 0.05$ was considered statistically significant.

2.2 Results

The hospital quarterly observations from 25 hospitals are based on a total of 3562 completed patient satisfaction surveys (average number of surveys/observation=18) and clinical data on 6467 patients in the CRUSADE registry (average number of

patients/observation=32). The relatively small number of surveys per observation will increase noise in our model, making it more difficult to obtain significant associations. Table 1 shows the diversity of our hospital sample on 4 different dimensions, including academic affiliation, size, geography, and structural resources. In general, these hospitals tend to be larger than a national comparison (national median = 168 licensed beds) with a richer mix of teaching affiliated institutions (national basis = 7%).

Table 1: Characteristics of Hospitals Included in the Final Analysis

Characteristic	N (%)*
Academic affiliation	
Teaching	7 (28)
Community	18 (72)
Size, median number of beds, (IQR)	372 (204–522)
Region	
West	2 (8)
Northeast	8 (32)
Midwest	7 (28)
Southeast	8 (32)
Cardiology resources (highest level)	
Diagnostic catheterization	4 (16)
Percutaneous coronary intervention	2 (8)
Cardiac surgery	19 (76)

* Unless otherwise indicated.
IQR = inter-quartile range.

Table 2 shows the variation of quarterly hospital-level guideline adherence scores (technical care) and risk-adjusted inpatient mortality for AMI (outcome).

Table 3 displays the median and inter-quartile quarterly hospital-level patient satisfaction scores for cardiac admissions for each of the 9 dimensions, as well as the overall satisfaction measure (inter-personal care score). As can be seen from these tables, there is substantial diversity in our sample of hospitals and scores. Moreover, there is more variation among technical care scores than inter-personal care scores.

Table 4 reports the correlations between the quarterly hospital-level inter-personal care scores for cardiac admissions and adherence to the 14 technical quality measures. Inter-personal care was positively correlated with 13 of these 14 measures, although only 4 measures were significant at the $p=0.05$ level. However, at a more aggregate level, we found that inter-personal care was significantly and positively correlated with the acute, discharge, and overall composite technical care measures. In addition, higher inter-personal care scores were associated with lower outcome rates ($\rho = -0.216, p = 0.002$).

The regression associated with the Durbin-Wu-Hausman analysis was significant at the $p = 0.01$ level. More importantly, the coefficient on the residual variable was not significant ($p = 0.29$). This indicates that the inter-personal care score is not correlated with any omitted fixed hospital effects and thus is not biased by not including fixed hospital effects in our analyses.

Table 2: Quarterly Hospital-level Process Measure Adherence Scores and Risk-adjusted Inpatient Mortality for AMI from January 2001 to December 2006

	25%	Median	75%	Mean number of patients per observation
Acute measures				
Aspirin within 24 hours	94.0	97.8	100	33
B-blocker within 24 hours	84.6	93.8	98.3	31
Heparin, any	84.2	90.8	97.6	32
Glycoprotein IIb/IIIa inhibitor	41.2	55.9	69.6	27
Cardiac catheterization within 48 hours	58.1	75.3	84.7	30
ECG within 10 minutes	26.0	37.5	50.3	25
<i>Acute composite</i>	70.4	75.5	80.9	177
Discharge measures				
Aspirin at discharge	92.7	97.1	100	28
B-blocker at discharge	87.8	95.2	100	28
ACEi or ARB for LVSD	66.7	80.0	100	5
Clopidogrel at discharge	60.0	75.9	89.7	27
Lipid-lowering agent	78.6	88.9	95.3	21

	25%	Median	75%	Mean number of patients per observation
<i>Discharge composite</i>	81.2	87.5	92.0	109
Secondary prevention measures				
Smoking cessation	75.0	93.9	100	9
Dietary modification	71.3	92.2	100	31
Cardiac rehabilitation	25.0	63.3	88.9	27
<i>Secondary prevention composite</i>	58.3	77.9	91.9	67
Overall Technical Care score	71.5	80.0	84.6	353
Adjusted inpatient mortality rate	0	3.60*	5.33	32

* Weighted mean.

ACEi = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; ECG = electrocardiogram; LVSD = left ventricular systolic dysfunction.

Table 3: Quarterly Hospital Inter-personal Care Scores for Cardiac Admissions from January 2001 to December 2006

	25%	Median	75%	Mean number of patient surveys per observation
Patient satisfaction measures				
Admissions	81.8	85.9	89.2	17
Discharge	80.0	83.3	86.9	17
Meals	75.0	79.2	83.1	17
Nurses	85.1	88.4	91.5	18
Personal issues	81.3	84.3	87.6	17
Physicians	83.2	87.0	90.0	17
Rooms	76.3	79.7	83.7	18
Tests and treatments	82.4	85.0	87.5	17
Visitors and family	82.4	85.8	89.3	16
Inter-personal Care	86.2	89.2	92.4	18

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Table 4: Pair-wise Correlations of Inter-personal Care for Cardiac Admissions with Technical Care Measures and Outcome

Variable	Correlation coefficient with inter-personal care	P-Value
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Variable	Correlation coefficient with inter-personal care	P-Value
Acute clinical measures		
Aspirin at arrival	0.114	0.106
B-blocker at arrival	0.117	0.097
Heparin, any	0.086	0.221
Glycoprotein IIb/IIIa inhibitor	0.054	0.45
Cardiac catheterization within 48 hours	0.183	0.009*
ECG within 10 minutes	0.014	0.845
<i>Acute composite</i>	0.148	0.035*
Discharge clinical measures		
Aspirin at discharge	0.13	0.07
B-blocker at discharge	0.147	0.04*
ACEi or ARB for LVSD	0.101	0.176
Clopidogrel at discharge	0.161	0.023*
Lipid-lowering agent	0.199	0.005*
<i>Discharge composite</i>	0.215	0.002*
Secondary prevention clinical measures		
Smoking cessation	0.114	0.118

Variable	Correlation coefficient with inter-personal care	P-Value
Dietary modification	0.119	0.091
Cardiac rehabilitation	-0.003	0.965
<i>Secondary prevention composite</i>	0.080	0.255
Technical Care Score	0.163	0.021*
Risk-adjusted inpatient mortality rate	-0.216	0.002*

* $P < 0.05$.

ACEi = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; ECG = electrocardiogram; LVSD = left ventricular systolic dysfunction.

Table 5 presents the logistic regression estimates for both the univariate and multivariate analyses when the dependent variable is (1 – risk-adjusted mortality); i.e., outcome in this case is survival. As can be seen from these results, both technical care and inter-personal care are significantly and positively associated with outcome even after controlling for the other factor, with p-values of 0.001 and 0.025, respectively.

To better interpret the managerial significance of these results, we performed sensitivity analyses to determine the change in predicted survival associated with a 1-quartile improvement in either inter-personal care, while keeping technical care fixed, or the converse. One-quartile improvements in inter-personal care scores were associated with higher risk-adjusted survival over all 4 quartiles of improvement (OR 1.87, 1.09, 1.09, 1.24, respectively; all $p < 0.05$) (Figure 4). Similar analyses were done for technical care. One-quartile improvements in inter-personal care scores produced very similar increases in predicted outcome compared to one-quartile improvements in technical care scores. For example, a one-quartile improvement (75th to 100th) in either inter-personal care or technical care yielded the same change in predicted survival (OR 1.24). As might be expected, larger improvements were observed from moving from the lowest scoring hospital to the 25% percentile and from the 75% percentile to the highest scoring hospital. Also, improving technical care had more impact in hospitals below the median,

while little to no differences between the 2 scores were observed in terms of improvement for hospitals above the median.

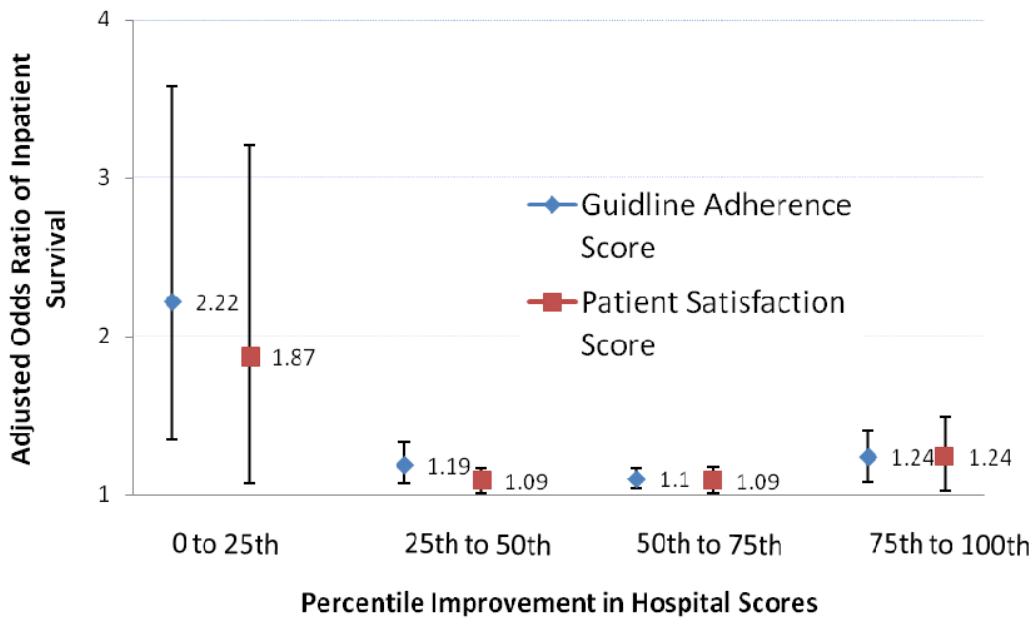


Figure 4: Change in predicted risk-adjusted inpatient survival associated with 1-quartile improvements in scores while keeping the composite guideline adherence composite score fixed and vice versa.

Table 6 presents the WLS results where the independent measures are the average quarterly scores from the patients' evaluations of the 9 different dimensions of their hospital experience and the dependent variable is the quarterly patient overall satisfaction score (our inter-personal care measure). Significant predictors of patient

satisfaction, in descending order, were: nursing care, physicians, personal issues, the admission process, and visitors and family.

There was no significant difference in the coefficients obtained for the relationship of overall satisfaction and the 9 different dimensions of patient satisfaction between our study population and the 262 hospital quarters of patient data that were excluded because we did not have equivalent hospital quarter technical care data (Chow test: $[F\{10,443\}]=0.548; P=0.85$), nor was there any difference in the coefficients obtained for the regression between mortality and hospital-level technical care between our study population and the excluded sample of 6082 hospital quarters for those CRUSADE hospitals for which we did not have matched inter-personal care data (Wald $X^2=0.96; P=0.99$). These findings suggest that our results generalize to at least the population of excluded hospital quarters.

2.3 Discussion

The Institute of Medicine identified patient-centered care, or care that is “respectful of and responsive to individual patient preferences, needs, and values and ensures that patient values guide all clinical decisions,” as a key quality domain (Institute of Medicine 2001). Consistent with this notion, when we controlled for a hospital’s technical care, higher hospital-level inter-personal care scores were independently associated with lower hospital inpatient mortality rates. This suggests

that patients' assessment of their care provides important and valid information to consumers and hospital managers about the overall quality of hospital care beyond what technical care measures. This was the first of our findings indicating customer perceptions, even after controlling for a latent [to the customer] measure of service quality, tie to an ultimate measure of quality.

Table 5: Multivariable Logistic Regression of Technical Care for AMI and Inter-personal Care for Cardiac Admissions on AMI Risk-adjusted Inpatient Survival

	Univariable				Multivariable			
	<i>Estimate</i>	<i>Standard error</i>	<i>X² statistic</i>	<i>P-Value</i>	<i>Estimate</i>	<i>Standard error</i>	<i>X² statistic</i>	<i>P-Value</i>
Technical Care	2.37	0.64	13.77	<0.001	2.09	0.65	10.38	0.001
Inter-personal Care	3.51	1.22	8.22	0.004	2.82	1.26	5.02	0.025

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Table 6: Multivariable Regression of Determinants of Patient Satisfaction on Overall Satisfaction for Cardiac Admissions

Term	Estimate	Standard error	t Ratio	P-Value
Nurses section	0.393	0.061	6.49	<0.001
Physician section	0.176	0.056	3.14	0.002
Personal issues section	0.202	0.071	2.85	0.005
Admission section	0.106	0.044	2.40	0.017
Visitors and family section	0.124	0.061	2.04	0.043
Discharge section	0.082	0.058	1.40	0.163

Term	Estimate	Standard error	t Ratio	P-Value
Room section	-0.057	0.050	-1.14	0.254
Tests and treatments section	-0.075	0.077	-0.98	0.329
Meals section	0.041	0.045	0.92	0.360

This study was unique to the field in that it was the first to evaluate the association between patient satisfaction and mortality after adjusting for clinical quality. Prior to this, researchers had considered inter-personal care's relationship with other quality measures in isolation. For instance, Jha et al. (2008) found a strong positive correlation between inter-personal care and technical care. This study confirmed and extended those findings, and we uniquely found that inter-personal care was an independent predictor of risk-adjusted inpatient mortality. Further, Jaipaul and Rosenthal (2003) previously reported a negative correlation between inter-personal care and unadjusted mortality rates in a study of 29 hospitals in Northeast Ohio. That study, however, was limited to a cohort of hospitals in a small geographic area and did not adjust for clinical quality or patient risk factors when evaluating the relationship between patient satisfaction and outcomes. Our work in chapter 2 has addressed both risk-adjustment of the dependent measure, as well as controlling for technical care levels.

Our measure of inter-personal care was based on combining three customer satisfaction questions. However, given critics' concerns about patients basing their overall satisfaction on aspects not related to care (see 1.3.3) we analyzed whether underlying dimensions of inter-personal care were present in their overall service

evaluations. We found hospitals that score high on inter-personal care questions such as “skill of nurses (physician),” “how well the nurses (physician) kept you informed,” “amount of attention paid to your special or personal needs,” “how well your pain was controlled,” “the degree to which the hospital staff addressed your emotional needs,” “physician’s concern for your questions and worries,” “time physician spent with you,” and “staff efforts to include you in decisions about your treatment” were strongly correlated with overall satisfaction. In contrast, there was no association with scoring high on questions concerning the room (e.g., “room temperature and pleasantness of room décor”), meals (e.g., “quality of food, temperature of food”), tests (e.g., “waiting time for tests or treatment”), and discharge (e.g., “speed of discharge process”). It should be noted, this does not mean these measures do not reflect some dimension of quality, only that customers were not using them to base their overall satisfaction ratings after adjusting for the other measures. Moreover, if inter-personal care reflects the quality of patient interactions with the care providers, then it is comforting we found nursing care and physician care were the most important determinants of overall satisfaction to the patient. This is a significant finding in light of the concerns that patients base their overall assessments/satisfaction on factors other than process care.

2.3.1 Implications

We believe these results have strong implications for measuring and managing the quality of medical care. First, these results give strong support to the premise that customers (patients) are a credible source of valid information when assessing and managing service quality (medical care) and that this information represents a different aspect of quality than the technical knowledge /competence-based service the provider delivers (a hospital's adherence to clinical performance measures). Second, this source of information should be very useful in helping managers identify ways to improve the overall quality level, in our setting, at hospitals. Our results imply that the effect of improvements in patient satisfaction on mortality were almost as large as those associated with improvements in technical care. The broader service quality implications are significant. For instance, extended to academia, this implies the efficacy of a service provider - whether professor, physician, lawyer, or other - is equal part academic knowledge (technical) and inter-personal skill. Yet curriculum for most professional programs is unbalanced in that it is overwhelmingly weighted towards the acquisition of knowledge (technical skills) relative to developing inter-personal skills for the students.

For the medical field, our findings also imply that obtaining increases in inter-personal care will require attention to specific aspects of the patient's experience. Thus, patients seem to differentiate between the technical and non-technical aspects of medical

care. Consistent with this observation, early invasive management (catheterization) was the clinical practice guideline most strongly associated with patient satisfaction and has previously been associated with a lower risk of inpatient mortality (Bhatt et al. 2004). Consequently, increasing inter-personal care scores is less about making the patients “happy” (e.g., improving the food, room décor, etc.) and more about increasing the quality of the interactions between the patients and staff, particularly the nurses and the physician. Moreover, by improving service in the facets patients base their evaluations on most – i.e. nursing and physician care - hospitals should be able to increase the quality of care as measured by reduced mortality rates.

Our results also highlight that the quality of care includes actions other than those measured by technical measures. This is particularly true for actions associated with nurses, an area that is not well captured by current technical measures (Kurtzman et al. 2008). In this study, the largest independent predictor of inter-personal care was satisfaction with nursing care. A growing body of evidence supports a robust relationship between the quality of nursing care and patient safety and outcomes (Needleman et al. 2002; Needleman et al.2007), and continued efforts are needed to measure and improve the quality of nursing care (Kurtzman and Corrigan 2007). We surmise that it may be efficient to capture important aspects of nursing quality by asking patients for feedback. A similar process could be used to assess the quality of discharge

planning in an effort to reduce readmission rates and outpatient mortality (Ross et al. 2008; see Chapter 3). These applications highlight the potential value of customer perceptions of quality, not only to provide consumers with more information about patient experiences, but also to help managers evaluate hospital actions aimed at improving the quality of care.

2.3.2 Limitations

This first study has several potential limitations. First, our sample was limited to hospitals that participated in CRUSADE and collected inter-personal care data. This sample, however, included a diverse group of hospitals with respect to size, academic affiliation, and geography but was biased towards hospitals with full invasive and revascularization capabilities; thus, our results may not be generalizable to hospitals without revascularization capabilities. In addition, while one could argue that these hospitals have higher motivation for quality improvement than the average hospital via their participation in CRUSADE, we do not have a plausible explanation for why the interrelationship between technical care, inter-personal care, and outcomes is fundamentally different in these hospitals in comparison with a national cohort.

Second, while our study population is smaller than some previously published reports of patient satisfaction (Jha et al. 2008), a smaller sample should actually bias against finding a significant association between inter-personal care and outcomes.

Moreover, as discussed above, whenever we were able to compare our results with larger samples of Press Ganey and CRUSADE hospitals, we found a strong correspondence. Similarly, our univariate results are similar to those reported elsewhere (Jaipaul and Rosenthal 2003). We take these findings to suggest that our sample is representative of a more general population of hospitals and that, although our sample sizes are not large, our findings are not due to random error.

Third, our study is limited to AMI, so the results are not necessarily generalizable to other medical or surgical conditions. Fourth, there is potentially an issue with censored sample bias as we could not obtain patient satisfaction data for patients who died. This phenomenon, however, actually created a bias against finding an association between hospital satisfaction and hospital outcomes.

Finally, it is important to note that by testing for endogeneity we were able to address the possibility that inter-personal care scores were related to some fixed hospital effect such as managerial competence or hospital facilities, and it was this (unobserved) fixed effect that was affecting mortality and not patient satisfaction scores. Our results provided us with assurance that we were likely observing the true association between inter-personal care and mortality rather than an association occurring due to other unmeasured factors.

In summary, our findings are encouraging in that customers' perceptions of inter-personal care are consistent with theoretical dimensions of interpersonal care, and that after controlling for unobserved (by the patient) technical care during the service encounter inter-personal care still correlated with outcomes. However, the small sample size and lack of multiple service lines (i.e., outcome was a single measure) limits our ability to generalize these results. Our subsequent studies address both of these issues.

3. Customer Feedback Validity: Generalizing the Results¹

Chapter 2's findings were encouraging, but both the sample size and focus on a single clinical outcome (heart attack/AMI in-hospital mortality) limited generalizing the results across the healthcare industry. This study buttresses Chapter 2, addressing the limitations of sample and scope. First, the hospital sample is extended from 25 to approximately 2500. We also increase the clinical lines from one (AMI) to three (AMI, pneumonia, and heart failure) while leveraging a different outcome (readmission) that has gained considerable interest by both payers and policy makers.

Similar to mortality rates, hospital readmission rates are a critical outcome measure because they provide key information about the quality of administered healthcare. However, they also tie directly into the cost of health care. Recent estimates suggest that almost one fifth of Medicare beneficiaries who are discharged from a hospital are re-admitted within 30 days with an estimated annual cost of unplanned readmissions of \$17.4 billion (Jencks et al. 2009; MedPAC 2005). Although factors outside the hospital contribute to unplanned hospital readmission (Greenwald 2007; Jack et al. 2009) the fact that one-quarter of all readmissions occur within thirty days of hospital discharge suggests that there is room for improving the quality of inpatient and

¹ The basis of Chapter 3 is Boulding et al. 2011.

hospital discharge care. Therefore, understanding the factors associated with hospital readmission have important implications in managing the provision of health care.

Until recently, measurement of hospital quality has focused on how often the hospital delivers evidence-based clinical care, i.e. technical care, as well as patient outcomes such as mortality. Chapter 2 was an exception, where patient perspectives were incorporated into the quality framework for a small sample of hospitals. However, in June 2009, Medicare released the Hospital Care Quality Information from the Consumer Perspective (HCAHPS), a large database of information on patients' perceptions of their hospital experiences and, in particular, their interactions with the hospital's staff (CMS 2010; Darby et al. 2005). Although Chapter 2 provided evidence that the Press Ganey survey instrument provided information of the patients' perceptions of their experience that was unique from technical care as it relates to mortality, it is unclear whether the HCAHPS also captures a reliable measure of inter-personal care quality. Even if HCAHPS does, it is unknown whether the experiences patients evaluate in satisfaction surveys relate only to the most extreme in-hospital outcomes (i.e. mortality), or if customer-reported experiences are useful as a quality measure across other outcomes, such as readmission rates.

The study reported in this chapter is intended to extend the applicability of Chapter 2's findings by studying patient perceptions of inter-personal care (including

discharge planning) at approximately 2500 hospitals in the United States for which technical care measures and 30-day readmission rates for the following 3 clinical areas were available: acute myocardial infarction, heart failure, and pneumonia.

3.1 Methods

3.1.1 Data Sources

Our goal was to obtain measures of each hospital's quality of care, as well as good indicators of the hospital's technical care and patients' perceptions of interpersonal care. To do this, we used 2 major data sources.

The first major data source was the June 2009 release of the Hospital Compare database by the US Department of Health and Human Services (US DHHS 2009). It contained a 3-year aggregated mean of a hospital's 30-day risk-standardized readmission rates for 3 clinical areas (acute myocardial infarction, heart failure, and pneumonia) for the period July 2005 through June 2008. We also used this data source to obtain the annual technical process-of-care performance for the same 3 clinical areas for the same 3 years. We then combined these 3 years of data to form a 3-year mean for the same period for each hospital for each of the 3 clinical areas. We used the readmission rates to measure the hospital's quality of outcomes and the technical process-of-care data to measure the hospital's objective clinical performance.

The second major data source was the HCAHPS patient satisfaction survey for the period July 2007 through June 2008. We used this data source to measure patients' perceptions of a hospital's inter-personal care. Patients included in the satisfaction survey were 18 years or older, stayed at least 1 night in the hospital, and had a non-psychiatric diagnosis at discharge. The surveys covered admissions for medical and surgical care and were initiated between 48 hours and 42 days after discharge. Hospital-level means were adjusted by the Centers for Medicare & Medicaid Services to account for factors known to affect patient responses. These factors include the mode of survey delivery (e.g., mail vs. phone), patient mix (e.g., self-reported health and time between discharge and survey completion), and non-response percentages. These data were supplemented by data on hospital structural characteristics that were obtained from the database of the American Hospital Association.

It should be noted that these data sources do not allow us to link individual patients to the technical care they received or their readmission. Instead, just as in Chapter 2, these should be viewed as fallible measures of a hospital's quality of outcomes and the performance of in-hospital care provided to the hospital's patients in general (i.e., technical care and inter-personal care).

3.1.2 Study Population

We identified 4469 hospitals that reported 30-day risk-standardized readmission rates, 4488 hospitals that collected technical care measures, 3746 hospitals that collected HCAHPS surveys, and 6338 hospitals in the American Hospital Association database. Using the hospital as the unit of analysis for a given clinical area (e.g., acute myocardial infarction, heart failure, pneumonia), we included all hospitals that had complete information for readmission rates, technical care measures, inter-personal care measures, and American Hospital Association hospital structural characteristics. This process resulted in a sample of 1798 hospitals for acute myocardial infarction, 2561 hospitals for heart failure, and 2562 hospitals for pneumonia. The technical care data were based on 430,982 patients with acute myocardial infarction (mean, 240 per hospital); 1,029,578 patients with heart failure (mean, 402 per hospital); and 912,522 patients with pneumonia (mean, 356 per hospital).

3.1.3 Data Definitions

There were 18 technical care performance measures in the 3 clinical categories (7 for acute myocardial infarction, 4 for heart failure, and 7 for pneumonia). Using the composite scoring method by the Centers for Medicare & Medicaid Services, we calculated hospital-level percent compliance scores for each technical care category by dividing the number of times the procedures in a category were followed by the total

number of eligible times associated with those measures (Glickman et al. 2007; Premier Inc. 2009).

The HCAHPS database contains patient assessments of 10 dimensions of patient care derived from 18 individual survey questions. Most of the 10 dimensions of patient care were highly correlated. Based on prior work on customer satisfaction, we used 2 hospital-specific questions (“How do you rate the hospital overall?” and “Would you recommend the hospital to friends and family?”) to assess patients’ overall satisfaction with their hospital experience (Boulding et al. 1993; Boulding et al. 1999; White 1999). We postulated that this overall patient satisfaction measure would be an excellent (albeit fallible) measure of patients’ observations of the performance of the hospital’s staff’s inpatient inter-personal care and would be an important predictor of readmission rates. Note that such patient observations do not require literacy in medicine but only an ability to know if the service provider was effective in communication, responsive, and thorough with instruction. In Chapter 2, we found satisfaction with discharge-related care was not correlated with overall satisfaction after controlling for the care provided by nurses, physicians, etc. This lead us to postulate that patient satisfaction with a hospital’s discharge process might tap a different type of quality measure, specifically may be a good indicator of the hospital’s adherence to effective discharge policies and thus predict readmission rates for each of the clinical areas beyond what information is

captured in the patients' overall assessments of inpatient inter-personal care. We captured perceptions of discharge quality using the following 2 questions from the HCAHPS: "During this hospital stay, did doctors, nurses or other hospital staff talk with you about whether you would have the help you needed when you left the hospital?" and "During this hospital stay, did you get information in writing about what symptoms or health problems to look out for after you left the hospital?"

Consequently, we now have two measures of inter-personal care: one based on the overall satisfaction with the hospital experience (which, based on chapter 2, we posit is tied closely to the care focused on inpatient treatment) and one based on the satisfaction with the care provider's assistance in preparing for post-hospital care. For the remainder of this chapter we distinguish between the two dimensions of inter-personal care by addressing the former as overall patient satisfaction, and the latter as patient satisfaction with discharge planning.

We transformed the HCAHPS information on each hospital into overall satisfaction and discharge satisfaction scores as follows. The HCAHPS database reported the total number of patients surveyed and the percentage of patients who responded to the different levels of the particular question. For the 2 overall satisfaction questions, the database provided 3 levels (ie, a satisfaction rating of 1-6 [low], 7-8 [medium], or 9-10 [high]). We multiplied the percentage of patients who responded to a

given level by the numerical values of 0, 0.5, and 1 for low, medium, and high, respectively, to obtain scores between 0 and 1, where 1 indicates that all patients gave a high response and 0 indicates that all patients gave a low response to the particular question. The hospital-level overall patient satisfaction score is the mean of these 2 numerical values. For the 2 discharge questions, we converted the reported percentages into numerical values by assigning the percentage of “no” responses the value of 0 and the percentage of “yes” responses the value of 1 and averaging the 2 questions across respondents. Note that the Hospital Compare documentation does not provide patient satisfaction information for specific diagnosis related groups but instead reflects patient responses for several other units, as well as the 3 units we analyze. Therefore, the patient satisfaction scores used for analyzing readmission rates for acute myocardial infarction, heart failure, and pneumonia are the same for a given hospital and thus must be viewed as fallible measures of inpatient experience in the particular unit.

The hospital-level 30-day risk-standardized readmission rates and sample sizes were obtained directly from the Hospital Compare database, and our measures of hospital structural characteristics came directly from the American Hospital Association database. These measures included the number of beds, medical school affiliation, geographic region, and the presence of adult interventional cardiac catheterization facility, medical, and surgical intensive care units.

3.1.4 Statistical Analysis

Our primary objectives were to determine the association of hospital-level 30-day risk-standardized readmission rates (outcome) by clinical area with (1) hospital-level technical care as measured by the guideline adherence score in each clinical area (technical care) and (2) hospital-level overall satisfaction among patients of their hospital stay and interactions with the hospital staff and their view of the hospital's discharge process. We performed 3 separate logistic regression analyses in which the dependent measures were based on the risk-standardized hospital readmission rates for each of the 3 clinical areas (Hosmer and Lemeshow 1989). Specifically, we converted the readmission rates to 1 or 0 to reflect whether patients were readmitted. Therefore, positive coefficients indicate higher readmission rates. The unit of analysis was the hospital; therefore, hospitals with more patients were weighted more heavily. The independent variables were hospital-level service-line technical care, overall patient satisfaction, and patient satisfaction with discharge planning. We also included hospital structural characteristics to control for fixed effects that might influence the outcome measures.

To help inform the policy implications of the results, we performed sensitivity analyses to determine the change in predicted risk-standardized 30-day readmission rates associated with a change in hospital score from the 25th percentile to the 75th

percentile for the overall patient satisfaction score and for the patient satisfaction with discharge planning score, while keeping the hospital-level technical care score fixed. Conversely, we also examined the effect of the same inter-quartile change in hospital-level technical care, while keeping the patient satisfaction measures fixed.

Finally, we calculated pair-wise Pearson product moment correlation coefficients between the overall patient satisfaction score and the 8 other HCAHPS-reported dimensions of quality. This was to assess which dimensions were most associated with the patients' overall satisfaction with the hospital's quality of care.

We used JMP version 7.0.2 (SAS Institute Inc, Cary, North Carolina) for all statistical analyses. $P < .05$ was considered statistically significant.

3.2 Results

Table 7 gives the characteristics of the study hospitals. Although hospitals in the sample tended to be larger and better resourced than hospitals in the total sample of American Hospital Association acute care hospitals, the 3 samples represent a broad cross-section of US hospitals. Table 8 gives the distributions of the variables of interest, including the scores for overall patient satisfaction and patient satisfaction with discharge planning, the clinical composite score, and 30-day risk-standardized readmission rates. There was considerable variability in patient-reported measures and

clinical measures across hospitals. Note that the mean 30-day risk-standardized readmission rates are approximately 20% for all 3 clinical areas.

Table 9 gives the correlations among the variables. The 2 hospital-level patient reported measures were not highly correlated with the hospitals' clinical performance measures. Overall patient satisfaction and patient satisfaction with discharge planning were negatively and significantly correlated with higher 30 day risk-standardized readmission rates for all 3 clinical conditions. In addition, all 3 clinical composite scores were negatively and significantly correlated with higher 30-day risk-standardized readmission rates, although these correlations are smaller than those associated with the patient satisfaction scores.

Table 7: Characteristics of the Study Hospitals

Characteristic	Study Hospitals			All AHA Acute Care Hospitals (n = 4105)
	Myocardial Infarction (n = 1798)	Heart Failure (n = 2561)	Pneumonia (n = 2562)	
⁶⁹ Number of beds, median (inter-quartile range)	208 (122-333)	149 (69-276)	148 (69-275)	107 (42-230)
Interventional cardiac catheterization, No. (%)	1027 (57.1)	1046 (40.8)	1042 (40.6)	1314 (32.0)
Medical school affiliation, No. (%)	666 (37.0)	732 (28.6)	734 (28.6)	1026 (25.0)
Medical or surgical intensive care unit, No. (%)	1702 (94.7)	2219 (86.6)	2210 (86.3)	3038 (74.0)
US geographic region, No. (%)				
New England	133 (7.4)	150 (5.9)	152 (5.9)	184 (4.5)
Mid Atlantic	234 (13.0)	255 (10.0)	256 (10.0)	332 (8.1)
South Atlantic	330 (18.4)	424 (16.6)	418 (16.3)	579 (14.1)
East North Central	285 (15.9)	426 (16.6)	409 (16.0)	652 (15.9)
East South Central	132 (7.3)	224 (8.7)	225 (8.8)	349 (8.5)
West North Central	147 (8.2)	258 (10.1)	272 (10.6)	606 (14.8)

West South Central	224 (12.5)	372 (14.5)	367 (14.3)	644 (15.7)
Mountain	86 (4.8)	145 (5.7)	156 (6.1)	308 (7.5)
Pacific	227 (12.6)	307 (12.0)	307 (12.0)	451 (11.0)

Abbreviation: AHA, American Hospital Association.

Table 8: Distribution of Hospital-Level Patient Satisfaction Scores, Composite Clinical Scores, and 30-Day Readmission Rates

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Variable	5th Percentile	25th Percentile	Median	75th Percentile	95th Percentile
Patient-reported measures					
Overall satisfaction					
Myocardial infarction	66.3	74.5	78.5	82.3	87.0
Heart failure	66.4	75.0	78.8	82.8	88.3
Pneumonia	66.5	75.0	79.0	83.0	88.5
Satisfaction with discharge planning					
Myocardial infarction	71.0	77.0	80.0	83.0	87.0
Heart failure	70.0	77.0	80.0	83.0	88.0
Pneumonia	70.0	77.0	80.0	83.0	88.0

Composite clinical score					
Myocardial infarction	82.7	91.1	94.4	96.5	98.5
Heart failure	57.1	76.0	84.1	89.7	96.0
Pneumonia	76.1	84.0	88.2	91.4	95.1
30-day risk-standardized readmission rate					
Myocardial infarction	17.8	19.0	19.9	20.7	22.2
Heart failure	21.3	23.1	24.4	25.7	28.1
Pneumonia	15.6	17.0	18.0	19.2	21.2

Table 9: Variable Pair-wise Correlations^a

Variable	Patient Satisfaction With Discharge Planning	Composite Clinical Score	Risk-Standardized Readmission Rate
Myocardial infarction			
Overall patient satisfaction	0.613	0.252	-0.199
Patient satisfaction with discharge planning	—	0.211	-0.167
Composite clinical score	—	—	-0.098
Heart failure			
Overall patient satisfaction	0.604	0.110	-0.203

Patient satisfaction with discharge planning	—	0.126	-0.188
Composite clinical score	—	—	-0.090
Pneumonia			
Overall patient satisfaction	0.599	0.211	-0.159
Patient satisfaction with discharge planning	—	0.228	-0.129
Composite clinical score	—	—	-0.105

^a All correlations are statistically significant at $p < 0.001$

Table 10 gives the results of the multivariable logistic regression analyses for the variables of interest. All 3 clinical performance measures were negatively associated with higher 30-day risk-standardized readmission rates, although the acute myocardial infarction and heart failure measures were not statistically significant ($p = 0.16$ and $p = 0.06$, respectively). Higher overall patient satisfaction scores also were associated with lower 30-day risk-standardized readmission rates for all 3 clinical conditions. In this case, all 3 measures were highly statistically significant ($p < 0.001$). Finally, scores for patient satisfaction with discharge planning were associated with lower 30-day risk-standardized readmission rates for all 3 clinical areas and were statistically significant for heart failure and for pneumonia ($p < 0.001$ and $p = 0.02$, respectively).

Table 10: Multivariable Predictors of 30-Day Hospital Readmission Rates

Variable	Coefficient Estimate (Standard Error)	χ^2	P-Value
Myocardial infarction			
Overall patient satisfaction	-0.268 (0.084)	10.20	0.001
Patient satisfaction with discharge planning	-0.189 (0.113)	2.80	0.094
Composite clinical score	-0.184 (0.131)	1.98	0.159
Heart failure			
Overall patient satisfaction	-0.321 (0.048)	45.03	< .001
Patient satisfaction with discharge planning	-0.284 (0.062)	20.75	< .001
Composite clinical score	-0.051 (0.027)	3.54	0.060
Pneumonia			
Overall patient satisfaction	-0.232 (0.056)	17.11	< .001
Patient satisfaction with discharge planning	-0.169 (0.072)	5.56	0.018
Composite clinical score	-0.150 (0.053)	7.90	0.005

Table 11: Pair-wise Correlations of HCAHPS-Reported Dimensions of Quality and the Overall Patient Satisfaction Score

Variable	Correlation
How often did nurses communicate well with patients?	0.8447
How often was patient's pain well controlled?	0.8054
How often did patients receive help quickly from hospital staff?	0.7761
How often did staff explain about medicines before giving them to patients?	0.7398
How often did doctors communicate well with patients?	0.6946
How often were the patients' rooms and bathrooms kept clean?	0.6746
Patient satisfaction with discharge planning	0.6380
How often was the area around patients' rooms kept quiet at night?	0.6109

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Figure 5 shows that the odds of 30-day risk-standardized readmission were associated with inter-quartile improvements in hospitals' patient total satisfaction scores (i.e., overall patient satisfaction and patient satisfaction with discharge planning), while holding the clinical composite scores fixed, and vice versa. Inter-quartile improvements in patient total satisfaction scores were associated with significantly lower predicted 30-day risk-standardized readmission rates for acute myocardial infarction (odds ratio [OR] = 0.97; 95% confidence interval [CI], 0.94-0.99), heart failure (OR = 0.96; 95% CI, 0.95-0.97), and pneumonia (OR = 0.97; 95% CI, 0.96-0.99). Also shown are the inter-quartile improvements in the 3 technical care measures. The improvements in 30-day risk-standardized readmission rates associated with inter-quartile improvements in the patient total satisfaction scores for heart failure, acute myocardial infarction, and pneumonia were 4.9, 2.2, and 1.6 times higher, respectively, than those associated with inter-quartile improvements in the same 3 clinical composite scores.

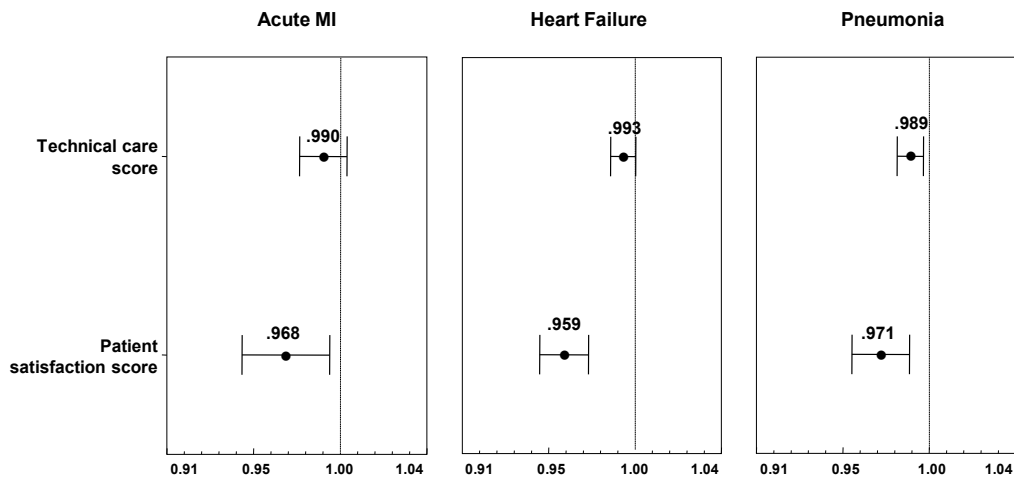


Figure 5: Odds ratios of readmission based on an inter-quartile improvement in technical or total satisfaction scores.

Table 11 gives the correlations of the overall patient satisfaction measure with each HCAHPS question category. Quality of communication by nurses had the strongest correlation with overall patient satisfaction, followed by several other measures that capture the patient’s interaction with the hospital staff. Patient satisfaction with discharge planning was seventh of the 8 questions in terms of correlation, indicating that it captured a different dimension from that captured by overall patient satisfaction. Also low in terms of correlation with overall patient satisfaction were the 2 questions concerning the hospital facilities (ie, cleanliness and noise level), again highlighting that overall patient satisfaction seems to be capturing the patients’ interactions with the hospital staff.

3.3 Discussion

A substantial proportion of Medicare beneficiaries experience an unplanned hospital readmission within 30 days of discharge. In this chapter, we found patients provided two unique dimensions of quality in their assessments of overall satisfaction and their perception of the hospital's discharge process. Each was significantly and negatively correlated with the hospital's 30-day readmission rates in the 3 clinical areas studied. Moreover, these 2 patient-related measures were more predictive of readmission than the objective technical care measures often used as the benchmark to assess the quality of hospital care. Although the key drivers of hospital readmission are complex, our findings suggest that patients' perspectives on inpatient care and discharge planning provide important insights into hospital performance with respect to quality. Moreover, because the overall satisfaction score is most highly correlated with factors associated with the patients' interaction with the hospital staff, our findings are consistent with the findings of chapter 2 as well as the observation by the Institute of Medicine that high-quality care is "patient centered" and responsive to patients' preferences, needs, and values (Institute of Medicine 2001). More generally, given the association between these patient perceptions and better outcomes (including our findings from chapter 2), our research suggests that patient-centered information on inter-personal care can be used to assess the degree to which patients will be more likely

to experience better health outcomes, as measured by hospital mortality and readmission rates.

3.3.1 Implications

Our findings from both chapter 2 and chapter 3 support the use of patient-reported information to complement the more used and more objective technical measures when assessing the quality of patient care for a given hospital. Chapter 3 addressed chapter 2's limitations in both sample and scale. Despite Brook et al.'s (1996) position that there is little evidence to claim generalized relations for the quality of care across different services, the studies of chapters 2 and 3 have found a consistent link between multiple health outcomes across a variety of diagnosed conditions from a national sample of several thousand firms. The studies have found customers can consistently provide a different dimension of quality evaluation based on hospital activities not considered in technical care measures alone. In addition, customers can provide *multiple* unique dimensions of quality as they relate to outcomes. For example, both chapters revealed customers' overall assessments of quality are driven primarily by inpatient care from nurses and physicians and not activities associated with discharge services. However, patients' perspectives on discharge services do provide an additional source of information about readmission rates, even after controlling for technical care and the overall satisfaction driven by inpatient care.

Customer provided measures of quality are not only clinically important in terms of providing a way to improve health outcomes, but surprisingly they appear as predictive of outcome status – if not more - than even technical care measures. For example, using our model estimates from chapter 3 we would predict that, if a hospital increased its patient total satisfaction score from the 25th percentile to the 75th percentile, this increase would be associated with decreases in 30-day readmission of 2.6% for acute myocardial infarction, 3.1% for heart failure, and 2.3% for pneumonia. If these reductions were obtained for our total sample of patients, this would have been associated with a reduction of more than 14,000 readmissions. Technical care, on the other hand, only associated with a significantly lower readmission rate in one of the three clinical cases (pneumonia).

Our finding that satisfaction with inpatient care and discharge planning is associated with better health outcomes is consistent with previous studies (Beach et al. 2006; Brody et al. 1989; Stewart 1995) that found a positive association between effective provider–patient communication and health outcomes. It is also consistent with chapter 2's findings where we had more fine-grained measures of patient satisfaction through the Press Ganey survey. In both chapters, using two different survey instruments on two different patient populations, we found customers' overall satisfaction with their service encounter is most weighted by their interaction with care providers, primarily nurses

and physicians (see Table 6 and Table 11), and least weighted with environment and comfort related aspects. Consequently, patients seem to differentiate between the inter-personal and aesthetic aspects of medical care. This leads us to believe that when patients indicate satisfaction they are not talking about being made “happy” via such actions as improving the food or the decor of the room, but more about the quality of their interactions with hospital personnel, especially nurses and physicians.

We note that hospitals have devoted substantial resources to managing the current core set of technical care measures (Fonarow and Peterson 2009). Despite dramatic improvements in clinical process performance for heart failure, there has been virtually no reduction in these readmission rates or costs (Curtis et al. 2008). Our findings confirm the lack of association between heart failure technical care and readmission rates (Fonarow et al. 2007; Krumholz et al. 2007). Conversely, we found that patient-reported measures were highly associated with 30-day readmission rates. Therefore, patient perceptions about hospital care in general and discharge planning specifically may provide an important new tool for measuring the quality of transitions of care.

Chapters 2 and 3 found the use of both technical and inter-personal care measures were unique and significant indicators of ultimate service quality, i.e. the risk-adjusted patient mortality and readmission rates. The results highlight a potential

problem for both marketing researchers – who rely heavily on customer perceptions in service quality measurement – and healthcare researchers – who rely heavily on clinical adherence in service quality measurement: when measuring service quality, the omission of one process care dimension may bias the researcher’s estimates of the other. Care must be taken in future research to address any modeling bias introduced by omitting either inter-personal or technical measures.

Finally, when taken in totality, chapters 2 and 3 offer several key insights for the broader service quality domain. First, customer assessments can, and do, identify unique dimensions of quality not tied to the technical aspect of the service encounter. Second, customer perceived service quality appears to have universal application. Satisfaction measures in our studies were collected across many service lines not studied as outcomes in chapters 2 and 3 (such as surgery, maternity, etc.). Yet, hospital-level customer satisfaction correlated with outcomes in every service line we considered in isolation. This was not true for every technical care measure even though it was at the specific unit level (see table 10). This may indicate customer service, even more so than technical competence, is a firm-wide culture that transcends departments/service lines. Third, customers are able to report multiple unique dimensions of quality in their assessments. In both chapter 2 and 3, overall customer satisfaction was not [conditionally] correlated to satisfaction with discharge planning. Yet, the customer

perspective on discharge planning – in addition to overall satisfaction – was a unique indicator of readmission rates. Service quality researchers should therefore be careful not to dismiss customer provided information not strongly tied to overall satisfaction, as it may be measuring a separate dimension of quality. And fourth, an historical problem with customer satisfaction surveys is the results are often not managerially relevant or actionable (Kordupleski et al.1993; Rust et al. 1995). Our analyses – whether on Press Ganey or HCAHPS – shows, when given a well designed instrument, customers are very much capable of producing consistent, logical, and actionable feedback to management that ties directly to the ultimate service quality.

3.3.2 Limitations

Our study has several limitations. First, because our data are cross-sectional versus longitudinal, we were only able to make associational and not causal inferences about the relationship between patient satisfaction and hospital readmission. Moreover, patient-reported information is likely a surrogate measure for specific hospital characteristics and practices (e.g., quality of staff and the use of clinical protocols) that determine quality of care. Chapters 5 and 6 explore these longitudinal and cultural aspects of service quality.

Second, our analysis is limited in that it does not include factors such as patient compliance and access to primary care, which are known to influence the likelihood of

hospital readmission (Shepperd et al. 2004). Moreover, chapter 3 only focused on short-term (i.e., 30 day) readmission rates and provides little information on long-term care.

Third, because our focus was on determining whether the Centers for Medicare & Medicaid Services measures of technical care and patient satisfaction are useful indicators of the overall quality of hospital care, the unit of analysis was the hospital and not the patient. This approach precluded the possibility of patient-level analyses that might provide insight into specific dimensions of the patient experience and related outcomes.

Fifth, one could infer that the association between patient satisfaction and outcomes can be explained by healthier patients' being more likely to report being satisfied (Covinsky et al. 1998). However, this is unlikely as the Centers for Medicare & Medicaid Services patient satisfaction surveys, when released to the public, are statistically adjusted to account for patient-specific influences.

Fifth, the period for the satisfaction data (2008) is not entirely contemporaneous with that for the technical care data and the outcome data (2005-2008). This was owing to pragmatic reasons associated with the availability of data. However, when we compared the 2009 satisfaction measures with the 2008 measures, we found no time trend and a correlation of 0.86 between the 2 yearly hospital-level measures, indicating

that they were stable (reliable) and a good proxy for the 2 prior years. Data in our later studies (see chapter 6) correct for this limitation.

Despite the limitations, chapters 2 and 3 provide considerable evidence that although customers may have little insight into the technical dimensions of their service encounters, they can assess other unique dimensions that are associated with better ultimate service quality.

4. Trickle-down Healthcare: An extended model of quality

In chapters 2 and 3 we show a significant correlation between customers' assessments of inter-personal care and their ultimate health outcomes after controlling for the technical quality of the service encounter. However, our process/outcome-centric model lacks a more cohesive framework. This chapter attempts to establish generalized empirical evidence for an extended model, which is based on the findings of our prior chapters, evidence from financial models of healthcare delivery, research of patient demographics, and the commonly accepted perceptual model of healthcare quality laid out by Donabedian (1978, see Figure 1). In particular, we examine whether ultimate quality is indirectly influenced by the customer base each hospital faces, a facet outside of management's control.

Although chapters 2 and 3 tested for the fixed effects of technical and inter-personal care, they did consider if the two work in concert. Both marketers and healthcare researchers have indicated quality dimensions are inter-related (Brady and Cronin 2001; Gronroos 1984; Rust and Oliver 1994). In healthcare, Donabedian (1988) noted the efficacy of the technical dimension is in large part dependent on the quality of the customer interaction. In a service setting technical prowess alone - whether a physician's, professor's, or lawyer's - cannot produce optimal customer outcomes.

Similarly, an abundance of inter-personal skills with an absence of technical ability is likely to be equally ineffective in improving customer outcomes. Competence (technical skills) and caring (inter-personal skills) are therefore both necessary elements in creating high-quality service, but neither by itself is sufficient. We extend our prior models by estimating the interaction of technical and inter-personal care as they relate to outcomes and hypothesize high levels of both will produce better outcomes beyond the fixed effects of each individual dimension. Earlier lab-based marketing research has found some dimensions of service are interactive (Hui et al. 2004), however, to our knowledge no prior research has considered how a measurable [and latent to the customer] dimension of competent service interacts with the customer's perceptions of service as they relate to outcomes.

Our prior models also only examined two of the three dimensions of care from Donabedian's framework, but lacked structure.¹ Structure pertains to the capital of the firm that enables the delivery of care and includes geographic location, physical plants/facilities, lab and testing facilities, medical equipment and supplies, information systems technology, telecommunications systems, personnel qualifications, certification and training, staffing mix, policies and procedures (as stated in manuals), hours of

¹ It should be noted marketers also incorporate aspects of infrastructure in conceptual models of service quality (Rust and Oliver 1994; Brady and Cronin 2001).

operation, clinical practice guidelines, preset treatment protocols, clinical reminder systems, and organizational culture. Although researchers have studied specific aspects of structure (e.g. property, plant, and equipment; Levitt 1994) more commonly structure is examined in light of the hospital's financial position. The reason is simple: a hospital's finances are in some way tied to virtually all of the aspects of structure listed above.

Hospitals that struggle financially reduce investments in infrastructure, human capital - including staffing levels (Bazzoli et al. 2004; Lindrooth et al. 2007; Zhao et al. 2008), and training. Likewise, facilities and equipment may not be kept up to date or in good working order, and access may be compromised (Bazzoli et al. 2007). They may also postpone or even eliminate quality-affecting investments such as those in clinical and administrative information technology, initial or ongoing staff training, evidence-based protocols, and quality improvement initiatives (Duffy and Friedman 1993; Hoerger 1991; Silow-Carrol et al. 2007; Werner 2010). Studies that examined process and outcome impacts through changes in payment levels found declining revenues had a negative impact on technical care and mortality (Dranove and White 1998; Hadley et al. 1989; Langa and Sussman 1993; Shen 2003). There is also a negative relationship between a hospital's investment in infrastructure (e.g. plant and equipment) and mortality rates (Cleverly & Harvey 1992; Kuhn et al. 1991) whereas higher investment is associated with lower failure rates of quality screens (Levitt 1994). Hospitals in weak financial states

exhibit higher mortality rates (Bazzoli et al. 2008), reduced patient safety (Encinosa and Bernard 2005), and a lower level of standards compliance laid out by the Joint Commission on Accreditation of Healthcare Organizations. And finally, Patient perceptions of quality are associated with hospital financial performance (Nelson et al. 1992). The evidence between financial health and the ability to deliver high quality healthcare is what leads MedPAC to evaluate the financial health of US hospitals and ensure their reimbursement rates are adequate for hospitals to continue investing in structure.

Although not all of the studies produced consistently significant results across all service lines, outcomes, or investments (Bazzoli et al. 2008; Navathe et al. 2012; Zhao et al. 2008), we accept and incorporate into our quality framework hospital financial health's likely association with structure and process, and may directly – or indirectly – associate with outcomes.

However, the financial health of a hospital cannot be separated from the payer mix it faces (Needleman 2011). Reductions in payments through government insurers, including Medicare and Medicaid programs, have adverse effects on the financial health of hospitals that serve government-covered patients, and that in turn reduces the quality of care those patients receive. For example, when Medicare decreases payments to the point a service is unprofitable the mortality rates associated with that service line were

found to increase (Lindrooth et al. 2013). Similarly, increased levels of government-covered patients are associated with lower scores for technical care (Culler et al. 2010). Payer mix, however, is not a random phenomenon across the entire population. The likelihood of having some form of [primary] government coverage is tied more so to elderly and minority populations, and these populations are not randomly distributed across hospitals.

The reliance of minority and elderly populations on government coverage is well documented, as are historical gaps in the quality of care delivered these populations (see Fiscella et al. 2000 for a review). Interestingly, recent research has indicated within hospitals insurance coverage (or lack thereof) is not a determinant in either the care received or outcomes experienced (Dozier et al. 2010; Neureuther et al. 2013; Taghavi et al. 2012). That is, the quality of care at a given hospital is the same for a given patient regardless of payment vehicle. However, these studies are most often of a single-hospital/care provider. Although within-hospital care of a patient may not be affected by the patient's coverage, healthcare quality across hospitals is likely tied to payer mix as manifested in poorer financial health. If hospitals face heterogeneous patient populations with respect to age and ethnicity, we may expect to find differences in quality outcomes based on factors outside of the control of the hospital.

We therefore present an updated framework of healthcare quality relating patient demographics, payment mix, hospital financial health, investments in structure, technical care, inter-personal care, and ultimately patient outcomes (see Figure 6).

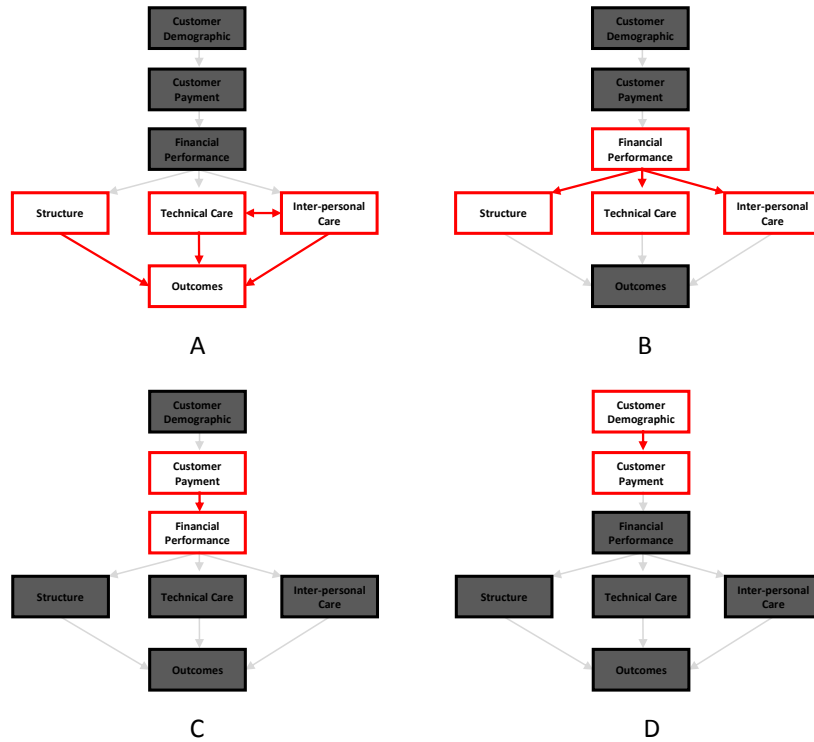


Figure 6: Four models to test: Infrastructure, process with interaction, and outcomes (A), financial health, infrastructure, and process (B), payer mix and financial health (C), and patient demographics and payer mix (D)

4.1 Methods

4.1.1 Data Sources

Our goal was to use measures of each hospital's patient demographics, payer mix, financial health, quality of process care, as well as patient outcomes. To do this, we used 4 major data sources.

The first data source was the Hospital Compare database of the US Department of Health and Human Services. We used this data source to obtain the annual technical process-of-care performance for 3 clinical areas (acute myocardial infarction, heart failure, and pneumonia) for the years 2005 through 2010.

Second, we obtained annual hospital 30-day risk-standardized readmission and mortality rates for 3 clinical areas (acute myocardial infarction, heart failure, and pneumonia) for the period 2005 through 2010 from Yale University's Center for Outcomes Research & Evaluation. This data is unique in that CMS only publishes outcomes to the public in aggregated 3-year intervals. To the best of our knowledge, this is the first study to utilize CMS' nationally risk-adjusted outcome measures in an annual longitudinal study.

The third major data source was the annual HCAHPS patient satisfaction survey for the period 2007 through 2010. We used this data source to measure patients' perceptions of a hospital's inter-personal care. Just as in chapter 3, patients included in

the satisfaction survey were 18 years or older, stayed at least 1 night in the hospital, and had a non-psychiatric diagnosis at discharge. The surveys covered admissions for medical and surgical care and were initiated between 48 hours and 42 days after discharge. Hospital-level scores were adjusted by the Centers for Medicare & Medicaid Services to account for factors known to affect patient responses. As before this measure is at the hospital level.

And fourth, financial data, payer mix, patient demographics, and hospital characteristics (e.g. ownership status, licensed bed count, etc.) were obtained from the California Office of Statewide Health Planning and Development (COSHPD) website for every general/acute care hospital for which there was at least two years of consecutive data. In constructing a national database for comparison and later analysis, we also collected non-GAAP financial measures such as operating margin and the percent net income from the Medicare Cost Report.

As in our previous chapters, these data sources provide hospital-level measures at either the clinical area (e.g. AMI) or hospital level, and thus do not allow us to link individual patients to any specific measure such as their payment status, the technical care they received, their perspective on inter-personal care, nor their individual outcome status. Instead, just as in our prior chapters, our measures should be viewed as fallible

aggregate indicators of a hospital's performance with respect to its total patient population.

4.1.2 Study Population

We first constructed a dataset on the national level, and then merged it with data unique to California to arrive at our final sample. We first identified 4484 hospitals nationally with 30-day risk-standardized readmission and mortality rates, 5210 hospitals that collected technical care measures, and 4656 hospitals that collected HCAHPS surveys. We also identified 5877 hospitals reporting financial measures in the Medicare Cost Report. Using the hospital as the unit of analysis, we included all hospitals that had complete information for readmission and mortality rates, technical care measures for all three clinical areas, the HCAHPS inter-personal care measures, and financial measures needed to calculate operating margins and percent net income. This process resulted in a sample of 3451 hospitals with complete data for at least two consecutive years.

We then identified 485 healthcare facilities (not all were hospitals) that reported in California's COSHPD financial database and 515 healthcare facilities reporting patient demographics, payer mix, and hospital characteristics. After merging those facilities with the national database of outcomes, technical and inter-personal care, we had 227 hospitals with complete information for at least two consecutive years and also maintained a 1-to-1 relation with a Medicare provider number. However, some of our

analysis did not require the full dataset with all information complete². Therefore, the equations representing Figure 6 had between 227 and 265 hospitals in their sample, and equation A.1 performed on the national sample had 3451 hospitals.

4.1.3 Data Definitions

Over this study's time period, the number of technical care performance measures Hospital Compare tracked varied slightly per-year and per-clinical area, but typically there were 18 measures available in the 3 clinical categories (7 for acute myocardial infarction, 4 for heart failure, and 7 for pneumonia). As before, we used the composite scoring method by the Centers for Medicare & Medicaid Services and calculated hospital-level scores for each technical care category by dividing the number of times the procedures in a category were followed by the total number of eligible times associated with those measures (Glickman et al. 2007; Premier Inc. 2009). Because aggregate clinical performance scores increased with time we eliminated the time effect by standardizing scores within each year. To do this we calculated the within year mean and standard deviation for each clinical area across all hospitals. Each hospital score within a clinical area was then standardized by subtracting the population's average score for that year and dividing by that year's standard deviation. Thus, each hospital for each year has three standardized quality measures of clinical care. We noted these

² For example, equation D.1 does not require outcome measures.

measures correlated highly with one another and appeared to load on a similar factor (loadings of 0.71, 0.86, and 0.73 for the California sample, and 0.57, 0.90, and 0.69 for the national sample). We thus created a single aggregate measure of the hospital's generalized clinical adherence by summing the three measures. Hospital technical care scores were once again standardized by year so that each hospital has a single measure of overall technical care per-year as captured by the standardized scores for the three clinical areas. However, for ease of interpretation of the interaction effects we test, we rescaled each year to all non-negative values by adding the additive inverse of the minimum value as a constant to all measures within that year. Therefore, each year's mean is approximately 3, with the same variance of 1 (with minimum value = 0).

The HCAHPS database contains patient assessments of 10 dimensions of patient care derived from 18 individual survey questions. We pulled survey results for 2007 through 2010 that align with a calendar year. Just as in chapter 3, we used 2 hospital-specific questions ("How do you rate the hospital overall?" and "Would you recommend the hospital to friends and family?") to assess patients' overall satisfaction with their hospital experience (Boulding et al. 1993; Boulding et al. 1999; White 1999). The results of chapter 2 and 3 also indicate this overall patient satisfaction measure is a good (albeit fallible) measure of patients' observations of the performance of the

hospital's staff's inpatient inter-personal care and is an important predictor of outcomes, whether mortality or readmission, and across multiple clinical areas a hospital services.

The HCAHPS database reported the total number of patients surveyed and the percentage of patients who responded to the different levels of the particular question. For the 2 overall satisfaction questions, the database provided 3 levels (i.e., a satisfaction rating of 1-6 [low], 7-8 [medium], or 9-10 [high]). Just as we did in chapter 3 we multiplied the percentage of patients who responded to a given level by the numerical values of 0, 0.5, and 1 for low, medium, and high, respectively, to obtain scores between 0 and 1, where 1 indicates that all patients gave a high response and 0 indicates that all patients gave a low response to the particular question. The hospital-level overall patient satisfaction score is the mean of these 2 numerical values. Note that the Hospital Compare documentation does not provide patient satisfaction information for specific clinical areas but instead reflects patient responses for several other units, as well as the 3 units we analyze. Therefore, each hospital has a single annual measure of inter-personal care that reflects patient perspectives from a wide sample of hospital services. To eliminate any time-effect we also standardize these measures within each year to have a mean of 0 and variance of 1. Just as with technical care scores, we rescaled each year to all non-negative values by adding the additive inverse of the minimum value as

a constant to all measures within that year. Therefore, each year's mean is approximately 3, with the same variance of 1.

The hospital-level 30-day risk-standardized readmission and mortality rates for acute myocardial infarction, heart failure, and pneumonia were obtained directly from Yale University's Center for Outcomes Research & Evaluation and provide hospital rates on an individual calendar year basis. CMS provides these same risk-adjusted measures on the Hospital Compare website, however they are bundled in 3-year increments, making longitudinal analysis difficult. The risk-adjustment process controls a particular hospital's outcome rates for patient demographics (gender and age), cardiovascular condition (such as chronic atherosclerosis and arrhythmia), and comorbidity (such as dementia and senility and iron deficiency and other/unspecified anemia and blood disease). For each outcome and clinical area we further standardized each value within each year, resulting in 6 fallible measures of outcome per-hospital per-year all on the same scale. After conducting exploratory factor analysis³ it appeared that readmission and mortality may represent two different dimensions of quality. However, a comparison of our base model (Figure 6 A) using the two different measures were not meaningfully different (Fisher's $Z = 1.13$, $p = 0.26$). Consequently, we decided to use a

³ We also performed a factor analysis on the national sample and again found weak evidence for there being two separate outcome factors and the readmission weakly loaded on one factor (0.35, 0.59, 0.50) and mortality on the other (0.20, .52, .55) for heart attack, heart failure, and pneumonia respectively.

formative model of quality (versus a reflective model) by combining all 6 standardized measures into a single measure of outcome for each hospital and each year⁴. Again, we standardized these values within each year for ease of interpretation.

There are numerous possible financial ratios that one might use to capture the financial health of an institution. We selected three based on the DuPont System which has been widely used in financial statement analysis to assess the overall financial health of an institution (Foster 1978). Each of the measures reflects a different aspect of financial health. The first measure, current ratio, provides information about the institution's ability to meet its short-term financial obligations. The second measure, gross operating margin, is a good indicator of the institution's ability to generate profits. The third measure, return on assets, captures how efficiently the institution utilizes its assets. We calculated each of these three measures for each hospital in the California system for each year. On the national level, we utilized the Medicare Cost Report to calculate operating margin and percent net income. Although concerns with using the Medicare Cost Report are well documented (Bazzoli et al. 2008), it is a widely used instrument in policy (MedPAC 2011).⁵ We therefore calculated operating margin (OM)

⁴ We note that combining uncorrelated measures may introduce more noise into our model, making significant results harder to obtain.

⁵ We find operating margin provided in the audited financials of COSHPD has correlation $\rho = 0.827$ with the Medicare Cost Report operating margin for the same hospitals and timeframe.

and percent net income for all hospitals in our national sample using Schumann's prescribed method (Schuhmann 2007).

Our analysis period was by calendar year, yet approximately 52% of the financial statements were based on financial years that were not aligned to the calendar year of January 1st to December 31th. Consequently it was necessary to convert these financial statements to a calendar year basis. We did this by looking at the two financial statements that covered the period of interest and then weighting the underlying financial data by the appropriate number of months associated with the calendar year of interest. For example if the hospital's financial data were for the period August 1st to July 31st, and we were interested in estimating its financial data for calendar year X, we would weigh the relevant financial figure (insert footnote about financial measure, not the ratio) from the financial statement in year X-1 by 7/12 and the same relevant financial figure from the financial statement in year X by 5/12.

Since the financial health construct is treated as an independent variable in some of our analyses, we standardized each of the three fallible measures of financial health with a mean of 0 and variance of 1 for each hospital for each year and added them together, thereby forming a single measure of the hospital's financial health per year. This aggregate measure now contains elements of the hospitals ability to meet short-term liabilities, capture profits, and generate value from assets. Again, for ease of

interpretation we standardize the entire hospital population DuPont scores by year. We refer to this combined measure in this chapter as the DuPont measure of financial health. Similarly, for the national data set, we standardized both operating margin and percent net income and then combined them into a single measure of financial health. We then standardized that measure within each calendar year across all hospitals.

Structure, in our model, represents the investments in physical assets. Again, there are multiple ratios that represent investments in physical assets but we chose the percent change in plant, property, and equipment (PPE), net of all depreciation as this reflects the relative investment in new structure which enables the delivery of care. Thus, it is an annual measure and not an aggregate measure over all prior years. As with the other financial measures, hospitals that did not report on a calendar year basis were adjusted accordingly. To control for factors that influence investments in PPE which all firms face (e.g. macro-financial problems in 2008-2009) we standardized the measures by subtracting the mean and dividing by the standard deviation in each year. Thus, changes in investments to PPE for our sample population within each year have a mean value of 0 and a variance of 1.

Patient demographics and payer mix were obtained from the patient discharge reports submitted to COSHPD. For each hospital we calculated the percent of patients covered by private insurers by dividing the number of reported privately insured

patients by the total of privately insured, Medicare, Medi-Cal, workers comp, county and other indigent programs, other government programs, and self-paying patients. We omitted patients in the categories “Other payer” and “Unknown” as we could not assign them to a payer group. However, these two categories combined make up less than six tenths of one percent of the total. Therefore, omitting them is unlikely to bias our results. Similarly, we calculated the percent minority as the sum of patients identified as black, Hispanic, or Native American divided by those same patients in addition to those identified as white and Asian. Two categories, “Other” and “Unknown,” were again omitted as we could not identify to which category they belong. These two groups combined represented 3.5% of the total admitted population. Finally, patient age was provided in 10-year ranges (e.g. 60-69). Due to the relationship between age and Medicare coverage we created an age variable that represents the ratio of all patients at a hospital for a given year reported in the categories “Age 60_69” “Age 70_79” and “Age 80 and above” divided by the total number of patients from all age ranges. The age category “Age Unknown” was omitted, and represented only 1/1000th of a percent of the admitted population.

Finally we collected from COSHPD hospital characteristics that were used as controls in our analysis. These measures included the number of licensed beds by year,

status as a teaching hospital, ownership status (e.g. investor, government, non-profit, etc.), and the presence of 24-hour emergency services.

To ensure no undue outlier influence in our analyses we first performed exploratory analyses on all of our measures. Specifically we classified and removed outliers defined as values 3 inter-quartile ranges above the 75th (Q3) quantile and below the 25th (Q1) quantile (NITS 2012).

Depending on the analysis, our California sample size varied between 227 hospitals and 265. For analysis on the national sample, 3451 hospitals were included.

4.1.4 Statistical Analysis

We had three primary objectives in this study: first, explore the interactive nature of technical and inter-personal care as they relate to ultimate outcomes. Second, identify the role a hospital's total financial health plays in determining an array of patient outcomes, particularly as they relate through investments in infrastructure and execution of process care. And third, determine if patient demographics relate to the financial health of the hospital.

We performed 4 separate linear models reflecting the relational components in our overall representation of delivered healthcare quality. Figure 6 represents each of the four relationships we test individually. The unit of analysis in each of the equations was the hospital. All of the following models include "k" hospital structural

characteristics to control for fixed effects including licensed bed count, ownership status (non-profit/church, government, and investor-owned), teaching affiliation, and on-premise 24-hour emergency services. We also test our models for unobserved fixed effects.

We begin by extending the general models of chapters 2 and 3 with an inter-personal/technical care interaction, and investments in infrastructure. The independent variable in our first model (equation A.1) was the combined standardized outcome scores from the 3 clinical areas and 2 outcome types. The dependent variables of interest were the standardized scores for inter-personal care, technical care (which itself is the combination of 3 scores), and investment in infrastructure.

$$\begin{aligned}
 & \textit{Patient Outcomes}_{j,t} \\
 & = \gamma_0 + \gamma_1(\textit{Technical Care}_{j,t}) + \gamma_2(\textit{Interpersonal Care}_{j,t}) \quad (\text{A.1}) \\
 & + \gamma_3(\textit{Infrastructure Investment}_{j,t}) + \gamma_4(\textit{Technical Care}_{j,t} \\
 & * \textit{Interpersonal Care}_{j,t}) + \gamma_{k+4}(\textit{Controls}_{k,j,t}) + \varepsilon_{j,t}
 \end{aligned}$$

for hospital j and year t. All of our following equations share the same subscript representation.

Our second set of models (equations B.1 through B.3) explores the predictive relationship of the hospital's financial health (DuPont) and the firm's ability to invest in infrastructure, and carry out technical and inter-personal care. We then determine if the DuPont measure should be included in our outcomes model (equation A.1) or if its

impact on outcomes is fully mediated by infrastructure and process care. Lastly, we also check if financial health Granger-causes any of our predictors in equation A.1.

$$\text{Technical Care}_{j,t} = \delta_0 + \delta_1(\text{DuPont}_{j,t-1}) + \delta_k(\text{Controls}_{k,j,t}) + k_{j,t} \quad (\text{B.1})$$

$$\text{Interpersonal Care}_{j,t} = \theta_0 + \theta_1(\text{DuPont}_{j,t-1}) + \theta_k(\text{Controls}_{k,j,t}) + m_{j,t} \quad (\text{B.2})$$

$$\text{Infrastructure Investment}_{j,t} = \pi_0 + \pi_1(\text{DuPont}_{j,t-1}) + \pi_k(\text{Controls}_{k,j,t}) + q_{j,t} \quad (\text{B.3})$$

The third model (Figure 6 C, and equation C.1) measures the relation between the hospital's financial health (DuPont) and the payer mix, specifically the percent of patients paying for services with private insurance plans.

$$\text{DuPont}_{j,t} = \alpha_0 + \alpha_1(\text{Private Payer Coverage}_{j,t}) + \alpha_k(\text{Controls}_{k,j,t}) + w_{j,t} \quad (\text{C.1})$$

The fourth model (D) then examines the relation between the percent of privately insured payers and the patient demographics the hospital serves. The patient demographics of interest are the age of the patient population (the percent over 60) and the percent of the hospital's patient mix represented by minorities (i.e. blacks, Hispanics, and Native Americans).

$$\begin{aligned} \text{Private Payer Coverage}_{j,t} & \quad (\text{D.1}) \\ &= \beta_0 + \beta_1(\text{Patient Age}_{j,t}) \\ &+ \beta_2(\text{Patient Ethnicity}_{j,t}) + \beta_k(\text{Controls}_{k,j,t}) + r_{j,t} \end{aligned}$$

We used JMP version 7.0.2 (SAS Institute Inc, Cary, North Carolina) and SAS version 9.2 (SAS Institute Inc.) to carry out all analysis; 2-tailed tests with $\alpha = 0.05$ were established as the level of significance.

4.2 Results

Table 12 gives the characteristics of the study hospitals, and a national sample compiled from the American Hospital Association annual survey as well as CMS' Hospital Compare database and Medicare Cost Report. 2007 was chosen as the reporting year as that was the first year in our study where all measures were available. Where national data (i.e. outside of California) was unavailable we left those fields blank. Although hospitals in the California sample tended to be larger than the national sample, ownership makeup and performance on technical, inter-personal, and outcome dimensions were often indistinguishable.

It is worth noting the considerable variation across the 6 outcome measures, as well as the 3 technical care scores. This, along with changes by year, necessitated our standardization procedure prior to combining scores into a single fallible annual measure of a hospital's performance (whether financial, technical, or outcome).

Table 13 displays the results of the linear regression analyses for our first model relating structure and process to outcomes (equation A.1). Although we control for observed hospital characteristic fixed effects, we also need to consider unobservable

effects. If unobserved factors are correlated with our explanatory variables and dependent measures then our regression coefficient estimates will be biased. It is reasonable to suspect an unobserved factor such as management skill may influence the independent and dependent variables in our analyses, such as financial health or a hospital staff's adherence to clinical guidelines. Therefore, it is necessary to either rule out, or control for, unobserved effects. We first apply Jacobson's (1990) tests for serial autocorrelation and state-dependency (also referred to as persistence). We found no indication the serially-correlated specification was appropriate. However, consistent with prior research (Bazzoli et al. 2008), we found a state-dependent relationship, where current inter-personal care, technical care, and investment in PP&E influence future outcomes through their association with the current outcome. More precisely, our dependent measures throughout our analyses are influenced by an auto-correlated unobservable variable which we must control for by lagging the dependent measure. We further tested our model for, and did not find, any fixed effect within our unobserved auto-correlated effect using Boulding's (1990) ρ -differing procedure. Last, we ran Hausman's test for fixed effects and found no indication unobserved fixed-effects will render our coefficient estimates inconsistent. Therefore, we present the state-dependent model in Table 13⁶.

⁶ All of our models in Tables 13 through 18 were estimated with the same controls, however for efficiency in

We find all three variables of interest – technical care, inter-personal care, and investment in infrastructure – are negatively and significantly correlated with our aggregate measure of outcome. That is, hospital-level increases in adherence to clinical guidelines, positive patient experiences, and investments in new equipment and facilities all associate with better (i.e. lower) hospital-wide outcomes. Although not of primary focus, we find, consistent with past research, hospital size also has a fixed effect on outcomes. That is, there is some positive effect to scale.

Although the sign is correct, we do not find a significant interaction between inter-personal care and technical care ($p = 0.74$). We noted, however, with the exception of our infrastructure measure, we can estimate equation A.1 with our much larger national sample. Other studies have represented structure through financial health and tested direct relations between financial health and outcomes (see Bazzoli et al. 2008; Encinosa and Bernard 2005). We too leveraged data available in the Medicare Cost Report to create a proxy to our prior infrastructure investment measure. In evaluating the general health of the national healthcare system, MedPAC annually reviews both the average operating margins and percent net income from the Medicare Cost Report (MedPAC 2010; MedPAC 2011). We therefore calculated operating margin (OM) and

presentation the tables only focus on the variables of interest.

percent net income (NI) using Schuhmann's (2007) prescribed method, leaving us with multiple measures of the hospital's financial health in a given year. As with the DuPont measure, we adjusted all reporting to calendar years, standardized those measures to be on the same 0-mean, variance of 1 scale, combined them, and then standardized again within each year. Therefore, in our national sample each hospital had a single aggregate measure of financial health per calendar year, which was used as a surrogate to control for investment in structure. For ease of interpretation of our interaction we also modified our two process care measures, technical and inter-personal care, by putting them on a ranked scale rather than the continuous standardized scale. That is, all scores inter-personal and technical care scores are on a scale from 0 to 1. For example, the highest inter-personal care score across hospitals for a given year is 1, and the lowest is rescaled to 0. Just as with the California-only sample, we tested for unobserved fixed effects and serial auto-correlation and found outcomes were state-dependent, although not serially auto-correlated. We also performed Boulding's (1990) and Hausman's specification tests, and found no evidence of auto-correlation or fixed effects impacting the consistency of our estimates ($X^2 = 3.13$, $p = 0.79$). As with equation A.1, our national sample includes a control for state-dependence. The results from our national sample are displayed in Table 14. Interestingly, the fixed effects of both inter-personal ($p = 0.28$) and technical

care ($p = 0.19$) have dropped out as explanatory variables. However, the inter-personal care and technical care interaction is significant ($p = 0.004$)⁷.

When we first tested equations B.1 through B.3, which correlate financial health with the three dimensions of delivered care (technical, inter-personal, and investments in PP&E), we found our DuPont measure only correlated contemporaneously with technical care ($p = 0.02$). However, in a subsequent step we tested whether financial health has a Granger-causal relationship with equation A.1's predictors of interest and found the DuPont measure Granger-causes (Granger 1969) technical care, inter-personal care, and investment in infrastructure ($F_{1, 1059} = 9.6, p = 0.002$; $F_{1, 420} = 9.4, p = 0.002$; and $F_{1, 900} = 6.2, p = 0.02$ respectively)⁸. Those results led us to update our model to capture a lagged effect between financial health and the three downstream measures. Results of the three models are presented in Table 15, where the estimate is of the coefficient to the 1-period lagged DuPont measure in each of the three separate equations B.1 through B.3. In each case, total financial health is a leading indicator of relative performance in both process care dimensions and the ability to invest in physical assets. Lastly, we checked for any direct effect of financial performance on outcomes by including the lagged

⁷ To ensure financial health does not also impact the slope of inter-personal and technical care, we ran a model with two-way interactions of financial health and inter-personal and technical care and find those interactions are insignificant ($p = 0.91$ and $p = 0.93$ respectively).

⁸ We also found similar Granger-causality on the national sample for the combined OM/NI financial measure on inter-personal care ($p < 0.0001$) and technical care ($p < 0.0001$).

DuPont measure in equation A.1. Financial health was insignificant ($p = 0.50$), however we also recognized that technical care, inter-personal care, and investment in infrastructure may be fully mediating financial health's effect. To test the direct effect we ran equation A.1 replacing the three downstream variables with financial health. When we did this we found the result was insignificant ($p = 0.92$). Therefore, we find financial health effects outcomes indirectly through its relation with the hospital's ability to deliver quality process care and invest in infrastructure.

Finally, to gain further insight into the impact of hospital financial performance on temporal changes in quality we stratified our national hospital sample into three groups based on their overall baseline financial performance in 2005. For each of the financial measures we used 0 as the natural cutoff determining healthy vs. unhealthy (i.e. $OM > 0$ and $NI > 0$ are indications of health; MedPAC 2011).⁹ Hospitals that met none of the criteria were placed in the bottom group, Group 3 (i.e. poorest financial health), those that met only 1 of the criteria were placed in the middle group, Group 2, and those that met both $OM > 0$ and $NI > 0$ were placed in the top group, Group 1 (i.e. strongest financial health). We hypothesized over time hospitals will regress to the mean, that is, each group will converge to the average of the population. We then ran a bivariate

⁹ Bazzoli et al. 2008 perform a similar analysis of dividing hospitals into groups based on initial financial health. However, they did not rely on any natural cutoffs, but instead classified hospitals based on quartiles.

random intercepts linear model (score as the dependent variable, time as the independent variable) to evaluate the subsequent improvement in the hospital's standardized¹⁰ technical care and outcomes for each of the three groups from 2005-2010 as well as inter-personal care scores from 2007-2010. We ran these analyses only for hospitals with complete data covering the full timeline and had 3276 hospitals for technical care (Group 1 = 1607, Group 2 = 966, Group 3 = 703), 2358 hospitals for inter-personal care (Group 1 = 1195, Group 2 = 706, Group 3 = 457), and 3402 hospitals for outcomes (Group 1 = 1649, Group 2 = 1013, Group 3 = 740). Table 16 contains each of the coefficients on time for the respective measures. Figure 7 A through C present the mean values of each group over time. Hospitals starting off in the healthiest financial position (Group 1) did not regress to the mean over time, but actually increased their technical ($p = 0.001$) and inter-personal ($p < 0.0001$) performance relative to other hospitals. Their gains came at the expense of hospitals with mixed financial health in 2005 (Group 2: $p < 0.0001$ for both technical and inter-personal care). That is, over the long run a separation in relative performance occurs that is associated with an initial financial starting point. Interestingly, outcomes did not display a trend over time for any of the groups, indicating rather than regressing to the mean each group held their relative starting

¹⁰ For ease of interpretation, we ran this analysis with technical care and inter-personal care variables back on a standardized mean = 0, variance = 1 scale.

position over time. Similarly, hospitals with the worst initial financial health didn't make gains in technical care ($p = 0.16$), inter-personal care ($p = 0.46$) or outcomes ($p = 0.31$).

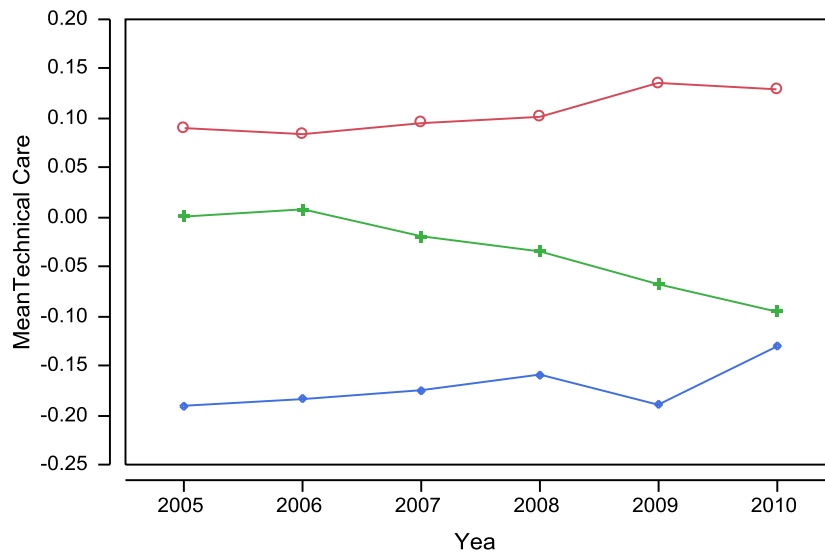


Figure 7 A ○ Group 1 + Group 2 ◇ Group 3

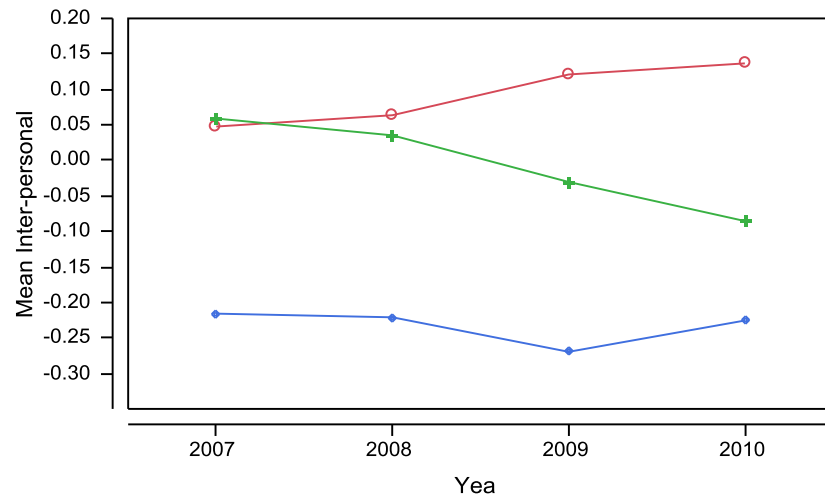


Figure 7 B ○ Group 1 + Group 2 ◇ Group 3

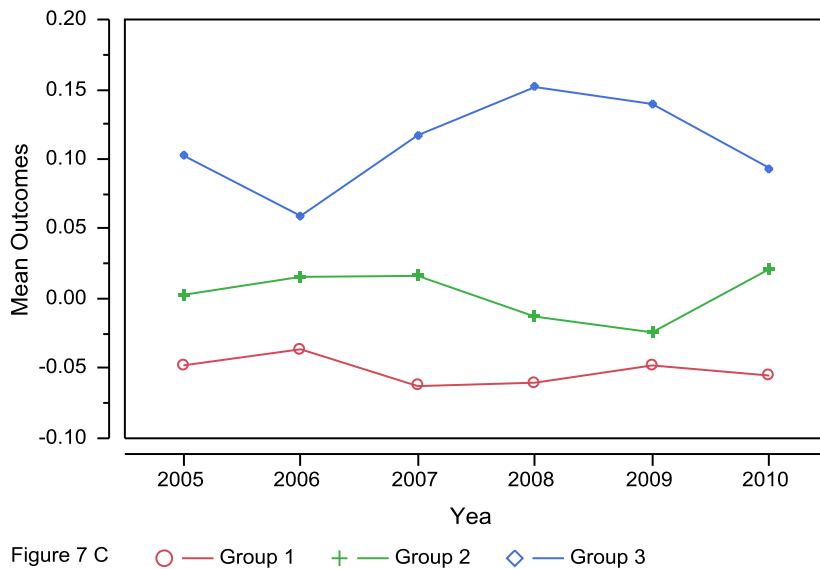


Figure 7: Time-trend of means for technical care (A), inter-personal care (B), and outcomes (C) based on 2005 financial health (Group 1 = Healthy, Group 2 = Middle, Group 3 = Unhealthy).

Our next model, in turn, considered the impact of payer mix on a hospital's financial performance (equation C.1). The results of Table 17 indicate a positive and significant ($p = 0.003$) contemporaneous relation between the percent of patients a hospital serves that are covered by private insurance and the hospital's total financial health. In addition, we again checked for Granger-causality and found the mix of patients covered with private insurance Granger-causes financial performance in the subsequent period ($F_{1,1024} = 11.4, p = 0.001$). This highlights the potentially complex and long-lasting impact payer mix has on a hospital's financial health, and indirectly its ability to provide quality service.

Last, we examined whether patient demographics had a role in determining the payer coverage, specifically privately insured populations. The results of Table 18 indicate they do, even after controlling for state-dependence. To grasp the strength of the contemporaneous relation between patient demographic and insurance coverage, Table 19 presents equation D.1 but without controlling for state-dependence (i.e. the correlation between the prior year's payer mix and current year). Based on Table 12, a hospital with the 75th quantile of black, Hispanic and Native American patients (52%) will face a payer base 14.5 percentage points lower than a hospital at the 25th quantile (16%). Given the median hospital in our sample has a 28% mix of privately insured patients, the potential impact of patient demographic on payer mix, and ultimately financial health, is not trivial. As we did with financial health and outcomes, we also tested whether patient demographics have a direct relation with financial health beyond what is captured indirectly through payer mix. To do so we conducted Barron and Kenny's (1986) mediation test. We found payer mix fully mediates the association between the elderly and minority patient composition and financial health of the hospital.¹¹

¹¹ In the third step of mediation, Payer mix was significant at $p = 0.0595$.

Table 12: Characteristics of the Study Hospitals: Median (2.5%, 25%, 75%, 97.5%). Year = 2007

	Study Hospitals (n=227)	National Hospitals (n = 3451)
Hospital characteristics		
Number of beds, mean	201 (31, 119, 356, 736)	168 (14, 42, 230, 651)
Hospital type, proportion		
Teaching	0.05	0.07
Investor Governed Hospital	0.20	0.17
Non-profit Governed Hospital	0.59	0.64
Government/University Hospital	0.21	0.19
On-site 24-hour Emergency Services	0.94	0.98
Patient Mix		
Over 60 Years Old	0.39 (0.12, 0.31, 0.48, 0.73)	
Black, Hispanic, & Native American (%)	0.34 (0.03, 0.16, 0.52, 0.87)	
Payer Private Coverage	0.28 (0.03, 0.19, 0.39, 0.63)	
Technical Care Scores		
Clinical Adherence: Heart Attack	0.95 (0.72, 0.91, 0.97, 1.00)	0.94 (0.50, 0.88, 0.97, 1.00)
Clinical Adherence: Heart Failure	0.88 (0.58, 0.81, 0.93, 0.99)	0.85 (0.23, 0.74, 0.92, 0.99)
Clinical Adherence: Pneumonia	0.90 (0.70, 0.85, 0.94, 0.98)	0.90 (0.64, 0.85, 0.94, 0.98)
Inter-personal Care Scores		

Overall Satisfaction	0.78 (0.60, 0.73, 0.81, 0.91)	0.79 (0.62, 0.75, 0.83, 0.92)
Outcomes		
Heart Attack (Mortality)	0.163 (0.142, 0.157, 0.171, 0.183)	0.163 (0.141, 0.158, 0.169, 0.185)
Heart Attack (Readmission)	0.200 (0.185, 0.196, 0.204, 0.215)	0.199 (0.185, 0.197, 0.203, 0.216)
Heart Failure (Mortality)	0.111 (0.091, 0.105, 0.120, 0.141)	0.111 (0.091, 0.104, 0.118, 0.137)
Heart Failure (Readmission)	0.246 (0.220, 0.239, 0.253, 0.273)	0.246 (0.219, 0.239, 0.255, 0.280)
Pneumonia (Mortality)	0.116 (0.090, 0.107, 0.126, 0.160)	0.113 (0.088, 0.104, 0.123, 0.149)
Pneumonia (Readmission)	0.181 (0.162, 0.175, 0.188, 0.209)	0.183 (0.163, 0.177, 0.190, 0.210)
Financial Measures		
Annual Revenue (millions)	\$133 (\$11, \$57, \$277, \$999)	
Current Ratio	1.66 (0.30, 1.06, 2.46, 5.17)	
Operating Margin*	0.02 (-0.21, -0.04, 0.07, 0.17)	0.00 (-0.30, -0.06, 0.05, 0.23)
Return on Assets	0.04 (-0.21, -0.01, 0.09, 0.27)	
Percent Change in PP&E	0.02 (-0.42, -0.04, 0.12, 0.64)	

*The national sample is based on the Medicare Cost Report and is non-GAAP

Table 13: Predictors of hospital-wide outcomes

Effect	Estimate	Standard Error	t-Value	P-value
Intercept	-0.0095	0.17855	-0.05	0.9577

Outcomes (-1)	0.3239	0.0332	9.76	<.0001
Technical Care	-0.0613	0.0300	-2.06	0.0397
Inter-personal Care	-0.1018	0.0410	-2.48	0.0133
Technical*Inter-personal Care	-0.0088	0.0267	-0.33	0.7417
Percent Change in PP&E	-0.1040	0.0501	-2.08	0.0383
Licensed Beds	-0.0007	0.0002	-3.08	0.0021
24 Hour On-site Emergency Services	0.1819	0.1693	1.07	0.2830
Government Hospital*	0.2175	0.0966	2.25	0.0246
Investor Governed Hospital*	0.0124	0.0925	0.13	0.8934
Teaching Hospital	0.1488	0.1549	0.96	0.3368

*Non-Profit and Church hospitals are the reference group

Table 14: National sample test for technical and inter-personal care interaction

Dependent Measure	Estimate	Standard Error	t-Value	P-value
Technical Care Rank	0.1366	0.1039	1.31	0.1887
Interpersonal Care Rank	-0.1085	0.1009	-1.08	0.2820
Financial Health	-0.0160	0.0063	-2.52	0.0118
Technical Rank*Interpersonal Care Rank	-0.4994	0.1713	-2.92	0.0036
Outcomes (-1)	0.4017	0.0088	45.84	< 0.0001

Table 15: Coefficient estimates for relation between lagged DuPont with process and infrastructure measures

Dependent Measure	Estimate of DuPont Coeff.	Standard Error	t-Value	P-value
Technical Care	0.0600	0.0305	1.97	0.0489
Interpersonal Care	0.0460	0.0210	2.18	0.0297
Percent Change in PP&E	0.0385	0.0171	2.25	0.0248

Table 16: Coefficient of time for technical, inter-personal, and outcomes scores based on 2005 financial health

Dependent Measure	Estimate of Time Coeff.	Standard Error	t-Value	P-value
<i>Group 1: Strongest Financial Health</i>				
Technical Care	0.0106	0.0032	3.34	0.0008
Interpersonal Care	0.0325	0.0049	6.65	< 0.0001
Outcomes	-0.0020	0.0047	-0.42	0.6746
<i>Group 2: 1 of 2 Measures Unhealthy</i>				
Technical Care	-0.0206	0.0041	-5.05	< 0.0001
Interpersonal Care	-0.0500	0.0071	-7.06	< 0.0001

Outcomes	-0.0016	0.0059	-0.27	0.7835
<i>Group 3: Poorest Financial Health</i>				
Technical Care	0.0085	0.0060	1.42	0.1565
Interpersonal Care	-0.0078	0.0105	-0.74	0.4600
Outcomes	0.0066	0.0065	1.02	0.3087

Table 17: Percent mix as a determinant of financial health

Dependent Measure	Estimate	Standard Error	t-Value	P-value
Payer Private Coverage	0.4303	0.1178	3.65	0.0003
DuPont (-1)	0.7794	0.0175	44.62	< 0.0001

Table 18: Patient demographic impact on a hospital's privately insured mix

Dependent Measure	Estimate	Standard Error	t-Value	P-value
Over 60 Years Old	-0.0273	0.0093	-2.93	0.0035
Black, Hispanic, & Native American (%)	-0.0183	0.0066	-2.78	0.0056
Payer Private Coverage (-1)	0.9498	0.0084	113.14	< 0.0001

Table 19: Patient demographic impact on a hospital's privately insured mix; non-state dependent

Dependent Measure	Estimate	Standard Error	t-Value	P-value
Over 60 Years Old	-0.2992	0.0321	-9.33	< 0.0001
Black, Hispanic, & Native American (%)	-0.4026	0.0203	-19.87	< 0.0001

4.3 Discussion

Healthcare researchers have long considered individual aspects and relations in measurement of delivered quality. They have also spent great effort understanding the quality of care for vulnerable populations, such as the elderly and minority groups. However, no study that we are aware of has taken a holistic view of the complex relations between patients, payers, finances, service, and outcomes within a single longitudinal study. Our results indicate hospitals face a complex series of inter-related factors – some of which are out of their control - that ultimately influence patient outcomes. Our first analyses confirmed and built upon the results of chapters 2 and 3 as we again saw both patient provided perspectives of their hospital experiences and adherence to clinical guidelines associate positively with outcomes (Boulding et al. 2011; Glickman et al. 2009). This study, however, was unique in that the outcome measure captured multiple service lines *and* multiple outcome types. In addition, we found firms that invest in infrastructure see gains in outcome quality separate from gains captured by the multiple dimensions of delivered process care. Although the direct relation between capital investment and outcomes has been explored before, our setting is unique in its control of both dimensions of process care. The use of all standardized values also allows us to compare the impact of our predictors directly. We found changes in inter-personal care have nearly double the impact of the same relative change

in technical care. Our analyses also expanded on prior analyses by modeling quality as a state dependent process, thereby acknowledging that a hospital's current outcomes are impacted by auto-correlated unobserved factors. This is different than assuming fixed effects, but instead assumes the prior conditions have a partial effect on current outcomes. Empirically, we find the carryover is $1/3$ of the overall effect.

Although we did not find a significant interaction of inter-personal and technical care with the smaller California dataset, our analysis using the national dataset produced a significant interaction. Not only was the interaction significant, but the fixed effects of technical and inter-personal care dropped from the model, indicating the explanatory power of one dimension of process care on outcomes is entirely dependent on the other. This has considerable implications for management, policy makers, and service quality researchers in general (see section 4.3.1). Consistent with the California data set, we found outcomes carryover (i.e. from the unobserved fixed effect) is $2/5$ of the overall contemporaneous effect.

Next, we found financial health of the firm has a lagged Granger-causal effect on the process and structure elements of care. Therefore, financial health has an indirect effect on patient outcomes as it relates through its impact on investments in infrastructure and our two measures of process care. After classifying hospitals into categories based on initial financial health, we found a long-term trend where hospitals

in good initial health separated themselves further on technical and inter-personal care relative to hospitals in worse financial condition. We also found no regression to the mean for outcomes, meaning well off hospitals held their position providing better quality, while financially unhealthy hospitals never made up ground.

We found financial health, in turn, was Granger-caused by the hospital's payer mix, which itself is determined by the initial patient demographic endowment. It is worth noting, however, that the impact of the patient demographic on the financial health of the hospital was fully mediated by payer mix (Barron and Kenny 1986). That is, elderly populations and minority groups in and of themselves do not lower a hospital's financial performance, but they do from the standpoint of the primary coverage with which they are correlated.

One aspect we faced in every level of our framework and analysis was a highly significant state dependency (every state-dependent variable in equations A.1 through D.1 were significant at the $p < 0.0001$ level). This indicates a "stickiness" to quality and its antecedents through factors unobserved in our study. This same principal was demonstrated in the analysis of Table 16 and Figures 7 A through C, as the initial financial health condition seems to point the way towards performance up to 5 years later.

4.3.1 Implications

Taken holistically, our study findings indicate the need several have alluded to, but may in reality be politically difficult to execute: so long as the payer mix a hospital faces has a significant bearing on its financial health, reimbursements that are based on delivering quality care need to be adjusted for the payer mix the hospital faces. This is true whether benchmarking on adherence to clinical guidelines, patient feedback through surveys such as HCAHPS, or outcome measures. Given the tight relationship between payer mix and patient demographic (in our study specifically patients over 60, black, Hispanic, or Native American), any such approach runs the risk of “institutionalizing substandard care” for at-risk and vulnerable portions of the population (Fiscella et al. 2000, pg. 2581). But proposals that focus on controlling for direct patient demographics would not be sufficient. For example, our data does not show a significant relation between the percent of patients over 60 years old and standardized HCAHPS scores ($p = 0.34$). This should not be surprising as age is already controlled/adjusted for in HCAHPS reporting (CMS 2013). However, our results indicate there is an indirect effect of age through the financial health of the hospital that must be accounted for lest hospitals serving elderly populations be at a perpetual disadvantage.

Despite ongoing criticism, the evidence continues to mount that patient-reported experiences are a unique and reliable source of service quality measurement across

multiple service lines and outcome types. Whether in the popular press (Falkenberg 2013; Gluck 2011) or peer-reviewed literature (Fenton et al. 2012) there remains strong resistance to the idea patients provide credible measures pertaining to healthcare quality. Although many of the concerns have been addressed (see Manary et al. 2013 for a summary), researchers continually fail to see the unique nature of patient reported experiences and their ties to quality healthcare. For instance, in a recent article regarding surgical quality measures, Lyu et al. (2013) argued patient experiences should not be a measure of surgical quality because they do not correlate with process care measures. This view inherently defines surgical quality on a single dimension: technical care, which they note has “long been used as markers of surgical quality” (pg. 366).

Our findings in this chapter indicate this perspective is seriously flawed. If at all possible, quality measures should be tied back to outcomes. Jha et al. (2007, pg. 1105) noted “The real goal of healthcare is to improve outcomes.” Our quality structure is anchored on outcomes as the ultimate objective, and in that structure we found relative improvements in inter-personal care has nearly twice the impact on outcomes as does technical care.

Even more surprising, our much larger national sample indicated – and just as Donabedian (1988) suspected – the relation between technical care and outcomes is entirely dependent on the level of inter-personal care, and vice versa. That is, not only

do inter-personal and technical care reflect unique dimensions of quality, they are inseparable in achieving better outcomes for patients. This finding has significant implications for managers, policy makers, and marketers alike. First, marketing researchers have concluded not all investments in quality initiatives are profitable (Hill 1993; Rust et al. 1995; Rust and Zahorik 1993). Similarly, we find efforts to better service quality through investments in improving either service competence (i.e. technical care) or inter-personal service (i.e. inter-personal care) will be futile if the other dimension is performing poorly. Similarly, managers who divert resources from one dimension (e.g. staffing or training) to improve the other (e.g. electronic record keeping) may negate any overall gains. Consistent with the findings of Chapters 2, 3, and our California sample (Table 13), in FY 2013 CMS recognized technical and inter-personal care as unique measures of quality by including both in their formula for determining reimbursement levels (CMS 2011). This is a positive step in incentivizing better service [and ultimately outcomes] for patients. However, although their algorithm rewards consistently good scores *within* inter-personal care, their formula fails to recognize the interaction between the inter-personal and technical dimensions. That is, the current approach of evaluating hospitals on technical and inter-personal care separately may encourage hospitals to invest in a sub-optimal fashion [to patients] relative to if the measures were evaluated jointly. To encourage management to invest in process care improvements most

beneficial to patients, we propose CMS consider updating their reimbursement formula to reward consistent scores *across* process care dimensions, not just within them.

Our choice of representing aspects within our framework with multiple measures helped reduce noise affiliated with examining a single-dimension. Just as care providers do not rely on a single vital statistic for patients, nor should researchers when examining hospital-wide relationships. In our case, technical care and outcomes reflected three service lines and two types of outcomes, respectively. The patient perspectives captured through HCAHPS are from patients hospital-wide, not a single service line. Financial health was measured as a combination of ratios that reflect three distinct aspects of a hospital's overall health. Single measures may represent one aspect well, but not in totality. For instance, Bazzoli et al. (2008) found inconsistent associations between individual financial measures (operating margin and cash-flow ratio) and outcomes and patient safety. To check the consistency of single measures of financial health in our study, we reran the Granger-causality tests, however this time using the individual financial metrics on inter-personal care, technical care, and investments in infrastructure. Our DuPont measure had a significant causal relationship with all three. However, the individual components of the DuPont measure – operating margin, current ratio, and return on assets – produced inconsistent results. Operating margin and current ratio both Granger-caused technical care, but return on asset did not.

Conversely, return on assets Granger-caused investments in infrastructure, but operating margin and current ratio did not. However, none of the three financial measures individually Granger-caused patient experiences. Had we relied on a single financial measure to represent the hospital's "true" financial health we would have missed key relationships in our framework.

A great deal of healthcare research has focused on the quality of care minority and elderly populations receive in the US healthcare system (Fiscella et al. 2000). Our findings indicate the catalyst to many of the relational findings researchers present (e.g. between race or age and process care) is the payer mix, not the demographics of the patient base. Recall, we find the patient demographic effect on financial health of the hospital is fully mediated by the payer mix (particularly, the percent of privately insured patients). Omitting the payer mix from any analysis will bias the impact of patient demographics as there is significant correlation between the two. For instance, in our California sample the percent of patients a hospital serviced that were of Hispanic ethnicity highly correlated with the percent of payments received through Medicaid programs ($\rho = 0.59$).

And last, we found the financial health of the firm is critical in achieving progress on relative measures of service quality. We found over time quality gaps between hospitals were either maintained (outcomes) or even widened (technical and

inter-personal care) based on an initial indication of financial health. Our results support previous studies which suggested competitive pay-for-performance programs which financially reward high-performing hospitals and penalize low-performing hospitals have the potential to exacerbate quality gaps at poor hospitals (Karve et al. 2008). In response to these concerns, federal policy expanded the bonus to low quality hospitals by designing programs which also rewarded improvement in addition to absolute performance. Jha et al. (2010) suggested this strategy could be effective. They found that among 251 hospitals participating in a the voluntary Premier federal pay-for-performance program, hospitals with more poor patients had worse baseline technical care but caught up to hospitals with fewer poor patients after financial incentives were introduced.

Our findings, however, suggest that financially distressed hospitals are the least likely to catch up to their peers. Hospitals in poor financial health likely lack the resources to oversee the necessary improvements in technical care, inter-personal care, and investments in infrastructure. A key difference between our analysis and the Premier study is that their work evaluated payer mix without controlling for underlying financial health. Since this program was voluntary, we suspect it attracted better managed and more financially healthy hospitals. If so, then financially-distressed institutions would be underrepresented in the Premier cohort and their results may be a

classic case of regression to the mean among equally financially healthy firms. Our results of financially distressed hospitals are the least likely to make relative improvements in quality is supported by Bazzoli et al (2006) who found that financially distressed hospitals were less likely to make investments in plant and equipment and on hospital standards compliance with selected Joint Commission on Accreditation of Healthcare Organization performance areas (Bazzoli et al. 2007). Similarly, under-resourced hospitals are less likely to make investments in electronic health records which could help facilitate compliance with and reporting of adherence to clinical practice guidelines (Jha et al 2009).

An alternative approach to providing financial incentives to financially distressed hospitals would be to invest in management and leadership development. Previous research has highlighted the role of committed executive leadership and boards in driving both the financial performance and quality of an organization (Glickman et al. 2007; IHI 2011). For example, in a study of 212 hospitals participating in a national quality improvement program for cardiac care, hospitals that had the highest level of administrative commitment to quality and worked to “free-up” financial resources for quality activities demonstrated the greatest improvement in quality over a four year period (Glickman et al. 2007). Greater efforts to develop programs that facilitate best practices among hospital boards and executive management at

underperforming institutions should be considered in an attempt to break hospitals out of a cycle of poor quality stemming from financial constraints (Jha and Epstein 2010).

4.3.2 Limitations

Our study has several limitations. First, the uniqueness of the data collected from the California hospital system potentially limits some of our findings. Although we were able to construct a national dataset on many of the core elements of equation A.1, we were unable to fill out the demographic, payer mix, and audited financial measures. However, our sample of California hospitals appeared consistent with the national pool in both make-up and performance across multiple areas (see Table 12). Further, using the national sample we tested for any inequalities in fixed-effect coefficients for equation A.1 based on state (i.e. California vs. non-California) and did not find evidence that either inter-personal care or technical care differed across states ($p = 0.27$ and $p = 0.34$ respectively).

Second, interpretability of aggregated measures and state-dependent models can make direct managerial insights difficult to obtain. Our multiple-measure approach is both a strength and a weakness. Our example of using single financial measures showcased the strength of the aggregate measure approach. On the other hand, the use of aggregate measures does not directly indicate the impact of decreases in privately insured patients with oft followed individual financial measures, such as operating

margin (MedPAC 2011). Such specific questions would require more narrowly defined examination.

Third, as in our other studies, our data is not at the patient level. Although this in one sense makes it harder to find significant relations, it also limits our ability to explore topics of interest. For instance, we cannot tell whether within a hospital privately insured patients report different levels of inter-personal care, or if they receive a different level of technical care. We only know that in aggregate a hospital with a higher mix of privately insured patients has better process care in total as a result of a healthier overall financial position.

Fourth, when we tested equation A.1 on the national sample we found technical care did not have a significant fixed effect, but inter-personal care did. It is likely, however, that inter-personal care reflects some elements of technical care. The roughly 24 clinical adherence measures CMS uses to evaluate hospital compliance are clearly not an exhaustive list of technical care a patient experiences. For instance, managing patients' pain requires technical skill in both prescribing the right medication (physician) and administering it well (nurses), but pain management is not measured as a clinical standard. It is, however, evaluated by the patient in HCAHPS (and other surveys, such as Press Ganey from chapter 2). We also know from Chapters 2 and 3 that pain management correlates/contributes to the overall evaluation in patient experiences.

Although some degree of technical care might be incorporated into patient satisfaction measures, this would only go to further bolster the validity of using patient provided feedback as a credible source of quality measurement.

Fifth, ideally we would prefer to test all the facets of Figure 6 in a system of equations that accounts for the potential error correlation across the equations. However, we found the fallout of combining four major datasets and requiring two or more consecutive years of all the measures left us with less than half our original sample size, and dropped the significance of roughly half our variables of interest. However, we had already tested for unobserved fixed effects and controlled for some aspects, such as management expertise, through the state-dependent structure within each equation. Therefore, we instead evaluated the points of greatest potential concern for correlation to common contemporaneous shocks. We thought of several aspects that might affect a single variable of interest, such as changes in government reimbursement rates on financial health, but we did posit that macroeconomic shocks could correlate across several of our equations. For example, a significant drop in macroeconomic conditions may simultaneously reduce the number of privately insured patients (i.e. lower employment levels), hurt hospital's financial positions through lower returns on endowments or fewer gifts, and patients may experience poorer outcomes as a result of being admitted with more serious complications as a result of postponing care

expenditures. We note that in the last case, the measures we used for outcomes and patient satisfaction are all risk-adjusted based on diagnosed comorbidity at admission and through self-reported health levels. On the other hand, financial performance and privately insured patient levels are not controlled for economic shocks, therefore our equation C.1 where financial health is the dependent measure could be subject to error. To test for contemporaneously correlated alternative explanations, we instrumented payer mix based on equation D.1 and retested equation C.1 through a two-stage least squares approach. We used the variables of equation D.1 as patient age and ethnicity is not changed by economic shocks, but those demographics are highly correlated with payer mix. We find after instrumenting payer mix equation C.1 still holds a significant relationship between financial health and payer mix ($\beta = 0.2867$, $p = 0.05^{12}$). Therefore, through our tests for unobserved fixed effects (Hausman specification, Boulding 1990), serially correlated errors (Jacobson 1990), state dependence (Jacobson 1990), and areas of greatest potential simultaneous contemporaneous shocks, we believe most alternative hypotheses regarding our results are addressed.

Seventh, due to the unique payment arrangements in the US healthcare sector our findings on the relation between customer demographics, financial health, and

¹² Although the significance is just under our $p = .05$ criteria, we note that this equation is still simultaneously controlling for other unobserved fixed effects through the state-dependent structure.

quality cannot be generalized across other industries. For instance, marketers have long established a relation between customer satisfaction and the financial benefits to the firm such as improved margins, customer retention and repurchase intentions, reduced risk to cash flows, reduced stock volatility; and benefits through word-of-mouth (Aaker and Jacobson 1994; Aksoy et al. 2008; Anderson et al. 2004; Capon et al. 1990; Fornell 1992, Luo 2009; Rust et al. 1995; Tuli & Bharadwaj 2009;). However, customers (i.e. patients) are rarely the ones paying: we found for our entire time horizon self-paying customers represented just under 3.5% of the patients. In addition, if at all possible customers in healthcare do not want to “repurchase” services, and the higher quality the service provider delivers the *lower* the likelihood that customer will return.¹³ Although most non-healthcare marketing contexts differ in these aspects, our finding of the interaction of competent (technical) and caring (inter-personal) service isn’t likely exclusive to just the healthcare field.

Eighth, our measures are all standardized, which makes our analysis a relative comparison, not an absolute measure. For instance, over our timeframe adherence to clinical standards (i.e. technical care) and patient experiences (i.e. inter-personal care) increased across the population of hospitals. So although a hospital may be falling

¹³ Hospitals do receive short-term monetary reward for better quality through higher reimbursement rates. However, the long-term impact of repeat customers is lost.

behind on a relative basis, our analysis does not infer about the absolute service provided. Interestingly, risk-adjusted outcomes were largely unchanged between 2005 and 2010. Both mortality and readmission rates for AMI showed a significant decrease ($p = 0.001$ and $p = 0.03$ respectively). Pneumonia mortality and heart failure readmission and mortality rates showed no improvement, although all the signs were increasing ($p = 0.41$, $p = 0.16$, and $p = 0.14$ respectively), while pneumonia readmission rates actually significantly increased over the time horizon ($p = 0.02$). Therefore, the risk-adjusted absolute outcome measures are likely directionally aligned with the findings from the standardized measures

Despite these limitations, we have found strong indication that delivering high quality outcomes for patients is a complex relation of process care, investments in infrastructure, financial health, payer mix, and patient demographics.

5. Improving the Patient Experience

Since HCAHPS' first public reporting in 2008, hospitals have faced a new paradigm in the measurement, reporting, and financial importance of patient reported experiences. Despite this, little has been done to identify the organizational and procedural efforts hospitals are making to manage the patient experience, and whether those investments are paying off from the patient's perspective.

Whether influenced by the mounting evidence that links patient reported experiences to better quality healthcare (Chapters 2 through 4; Manary et al. 2013), or that beginning in FY 2013 HCAHPS scores comprise 30% of total incentive-based payments from Medicare, hospital management has taken notice of the patient's voice and is prioritizing improving their patients' experiences. For instance, Jha and Epstein (2004) reported that 91% of surveyed hospital boards have specific goals for patient satisfaction, the highest among the four quality indicators they surveyed. Many hospitals report that they are now investing significant resources to improve the patient experience, but it is unclear whether the shift in management priorities is in fact reflected in better patient reported experiences. This information is critical to driving improvements in patient centered care at U.S. hospitals.

This chapter aims to better understand organizational approaches to managing the patient experience at U.S. hospitals and their relationship with publicly reported

HCAHPS scores. Specifically, we used a novel survey among VHA¹ network hospitals along with HCAHPS data to 1) characterize management processes around the patient experience, including leadership, organizational reporting structure, board involvement, compensation incentives, and workforce metrics, 2) describe the association between managerial approaches to service quality with publicly reported HCAHPS measures, and 3) identify key barriers to managing service quality at hospitals.

Our results indicate that hospitals are aware of how their patients perceive received care and the goal of improving the patient experience has garnered strong executive interest. However, we also find a gap in attitudes that exists between management and employees for measuring and improving the patient experience. Managing that gap may be a first step in improving patient experiences [and by extension HCAHPS scores] as we found organizations that foster a collaborative environment, incent and communicate well, and gain attitudinal alignment with staff (in particular physicians) outperformed their peers in patient evaluations.

5.1 Methods

An historical problem with customer satisfaction surveys is the results are often not managerially relevant or actionable (Kordupleski et al. 1993). However, researchers

¹ VHA is a nationwide network of leading community-owned health care organizations and physicians. VHA is not associated or affiliated in any way with the Veterans Health Administration of the U.S. Department of Veterans Affairs.

working with hospital satisfaction results, notably HCAHPS scores, have found patients provide consistent, logical, and actionable feedback for management. For example, patients overwhelmingly weight the quality of their interactions with physicians and nurses – and not environmental aspects such as food and room characteristics - when determining their overall satisfaction with hospital care (Boulding et al. 2011; Glickman et al. 2009). In addition, Meterko et al. (2004) found staff-reported perceptions of a teamwork-based culture were positively associated with patient-reported satisfaction. And the engagement and priorities of executives, whether CEOs or Board members, also appear to influence both the organization’s culture and performance (Jha and Epstein 2008; Rondeau and Wagar 1998).

Therefore, we designed our survey to capture dimensions of physician, nurse, and management priorities and attitudes about the patient experience, as well as the culture of the hospital.

5.1.1 Data and Sampling

Our study was performed in concert with the VHA Center for Applied Healthcare Studies, and targeted roughly 300 of the 1200 hospitals in the VHA network. In addition to the survey responses, we calculated measures of patient experiences from CMS’ HCAHPS survey.

We first calculated patient experience scores in a manner consistent with the hospital value based purchasing (VBP) program patient experience domain scoring methodology (CMS 2011). That is, our scoring measures are consistent with how hospitals are evaluated by CMS for payment. Hospitals under this reimbursement program are scored on both an Achievement basis (contemporaneous relative to other hospitals) and Improvement (longitudinal improvement of an individual hospital). Under VBP, each domain category is measured as the percent of patients who rated the service in the top rating category (often referred to as the top box in the marketing literature), and then is compared relative to the national sample (across hospitals, this is “Achievement” ranking) and as a change in performance (within hospital, this is “Improvement”). VBP weights each of the domains equally, therefore we first calculated Achievement scores by averaging the rank a hospital received across the 8 domains VBP monitors: physician communication, nurse communication, staff responsiveness, pain management, communication regarding medications, clean and quiet rooms, recovery instructions, and overall rating. These rankings are based on the national sample, just as they are calculated under the VBP program. We then generated an Improvement score by calculating the change in scoring for each hospital in each of the 8 domains over a 2-year window, then averaged across all the domains. We abstracted the 2012 HCAHPS score as well as the change in score from 2010-2012 for each participating hospital from

the Hospital Compare website based on the most recent data with periods ending 9/30/2012 and 9/30/2010. We note that this timeframe, although slightly preceding the time of survey administration, represents public HCAHPS scores from approximately 2 quarters after our respondents submitted their surveys due to a lag in CMS reporting.

5.1.2 Survey Development

We completed development of a 28-item survey instrument to assess key organizational approaches to managing the patient experience (see Appendix). This survey was based on prior studies from the medical and business literature and from input from the research team and national experts. After several iterations to refine the survey, our questions fell into two general categories of interest: 1.) operational activities and directions (e.g. organizational priorities, organizational actions, communication, and incentives) and 2.) organization attitudes towards managing the patient experience (e.g. cultural attitudes, perceptions of performance, and leadership commitment).

5.1.3 Survey Administration

We used Qualtrics to both administer our survey instrument and compile the results. The VHA Center for Applied Healthcare Studies and their regional VHA affiliate offices helped us identify the primary person responsible for managing the patient experience (i.e. chief patient experience officer) at each institution. These individuals became the targeted respondents for our survey. Notification of, and a link to participate

in, the survey was sent via e-mail to 344 hospitals starting in November, 2012. We sent the identified contacts e-mail reminders at 1-week and 1-month and performed telephone follow-ups for non-respondents after 1 month.

We received responses from 101 institutions for which we also have complete HCAHPS data for an effective response rate of 29%. Of our respondents, 46% self-identified as a Chief Nursing Officer, 23% were Quality Improvement Professionals (non-officer), 18% were Chief Experience or Quality officers, 5% were Chief Operating Officers, 5% were nursing staff (non-officer), 2% were Department or Division Chairs, and 1% were Chief Executive Officers.

5.1.4 Statistical Analysis

Because our sample of hospitals from VHA excludes for-profit institutions, we first tested whether our sample was representative of hospitals nationally. To do so we ran ANOVA tests comparing the VHA sample with the national sample on three major performance dimensions frequently considered in quality research literature: HCAHPS Achievement ranking and Improvement score, financial health, and patient outcomes. We also compared our hospital population with the national sample based on size dimensions such as the number of patients served annually as well as full-time equivalent employees.

When comparing our sample with a national sample of 3715² hospitals we found no difference in performance across the two groups. HCAHPS scores were not significantly different than the national sample of in either Achievement ($F_{1,3815} = 1.51$, $p = 0.22$) or Improvement ($F_{1,3815} = 0.032$, $p = 0.86$). Similarly, we did not find a significant difference in Medicare Cost Report financial health, whether operating margin ($F_{1,3650} = 1.2415$, $p = 0.27$) or percent net income ($F_{1,3650} = 0.0301$, $p = 0.86$). And finally, we found no difference in Hospital Compare reported outcomes: mortality for heart attack ($F_{1,2730} = 0.4562$, $p = 0.50$), heart failure ($F_{1,3984} = 1.5230$, $p = 0.22$), pneumonia ($F_{1,4284} = 1.5639$, $p = 0.22$), or readmission for heart attack ($F_{1,2380} = 1.0849$, $p = 0.30$), heart failure ($F_{1,4068} = 0.3647$, $p = 0.55$), and pneumonia ($F_{1,4299} = 0.0006$, $p = 0.98$). Therefore, despite being a sample population of all VHA network hospitals, we do not have reason to believe these hospitals perform any differently than US hospitals in general on measures of clinical guideline adherence, patient-reported experiences, or financial health.

Although there is no meaningful difference in performance, we did find on average hospitals in the VHA sample were larger in both patients served ($p = 0.002$) and number of full-time employees ($p = 0.005$) relative to the national sample. Therefore, all of our analyses control for hospital size, in addition to teaching affiliation and an indicator of urban/rural setting (Meterko et al. 2004).

² We report the F-statistic, where the degrees of freedom represent the national plus VHA population size

Using a multivariate analysis, we subsequently test each of our survey questions against the hospital's national Achievement and Improvement scores. Significant results are reported along with the survey statistics.

5.2 Results

Perceptions of patient experiences vs. reported experiences: As noted earlier, we measured both the respondent's perceptions of the hospital's Achievement ranking and Improvement score (both based on the national sample per VBP's method). We found actual Achievement rankings significantly correlated with respondents' beliefs about their HCAHPS performance relative to other hospitals ($p < 0.0001$). We note, however, that given the electronic delivery of the survey, respondents may have easily accessed the Hospital Compare website and thus just reported back current Achievement rankings. Interestingly, unlike Achievement, we find beliefs about Improvement scores were not only uncorrelated with actual Improvement ($p = 0.49$), but the sign indicated if anything hospitals that actually had lower improvement levels thought they had improved more than they actually did, while those with higher improvement levels indicated less Improvement than actually occurred. We also found Achievement rank is significantly correlated with perceived Improvements ($p = 0.0002$),

highlighting a potential bias that administrators believe their current Achievement is the result of continuous Improvement.

Within hospital patient experience communication: We found on average hospitals utilized 4.3 different modes of communication with employees to disseminate information about patient experiences. Department meetings were the most common avenue (97.3%), but email (88.2%), leadership meetings (85.5%), notices on patient units (74.5%), and other internal methods such as intranet and posters were also common (70.0%). Although we find no difference in Achievement ranking between hospitals that utilize electronic mail to communicate organization wide information about the patient experience ($p = 0.74$), we did find significant differences in improvements in HCAHPS scores for hospitals that utilize an electronic mail system ($p = 0.05$). Hospitals that utilize department-wide email systems saw on average Improvement scores 15 points higher across the 8 scoring domains.

Incentives and accountability: Table 20 displays the percent of hospitals employing different bonus and penalty programs for patient experience scores. We note the use of financial incentives is not commonplace yet, and financial penalties at either the individual provider or department/service line is nearly non-existent. We do find weak evidence that financial bonuses for entire departments/service lines are associated with greater changes in average Improvement scores ($p = 0.10$).

Respondents also indicated everyone (29.1%) or most people (45.5%) knew their role and were held accountable for improving and managing the patient experience. That left roughly a quarter of our sample indicating only some employees (21.8%) or even few people (3.6%) knew their role. We found no significant differences, though, between the level of accountability and either Achievement or Improvement. We also suspected there may be an interactive effect of incentives and accountability. That is, when employees are both incented and understand their roles patient experiences would be better and/or improved. However, we did not find any significant relationship.

Table 20: Incentives employed for managing the patient experience

	Percent
Financial bonuses for individual providers	30.0%
Financial penalties for individual providers	5.5%
Financial bonuses for departments/service lines	14.5%
Financial penalties for departments/service lines	0.9%
Public recognition of high performing individuals/service lines	74.5%
Detailed performance evaluations (individual providers)	35.5%
None	13.6%
Average incentives/penalties	1.94

Senior leadership and patient experiences: Board and CEO commitment to measuring and improving the patient experience in our sample hospitals is high. The majority of Boards (68.2%) were identified as viewing patient experiences as “Extremely important,” whereas CEOs were higher still (82.7%). This recognition was also reflected in the frequency with which hospitals discuss patient experiences at senior leadership meetings. Respondents indicated every hospital discusses them on at least a quarterly level, with 36.4% reviewing them weekly, and 53.6% on a monthly or bi-weekly review cycle. We also note that all but one hospital (99%) reported that HCAHPS data was shared with the hospital’s Board of Directors.

Organization quality goals: Table 21 displays the ranking of quality goals among our sample, as reflected by each hospital’s commitment and overall managerial effort with regard to the particular areas. The top priorities are patient safety such as hospital acquired infections and never events (57.6%), and efficiently managing the costs and lengths of stay (20.7%). Interestingly, hospitals place the least emphasis on three widely researched measures of quality: patient outcomes such as mortality and readmission (4.3% Most important), patient experiences (7.6% Most important), and quality as reflected by adherence to clinical protocol (9.8% Most important).

Organizational change: We found since the advent of patient experience reporting through the HCAHPS survey, hospitals have undergone changes in managing the patient experience. First, awareness among staff through internal communications increased at almost all of our hospitals (99.0%). Service-oriented initiatives (78.3%) and new training programs (82.6%) have also been popular reported changes, and the approaches to training are diverse. Internally developed training sessions for both front-line staff and top-level management are common (87.0% and 51.7% respectively), but so is providing feedback to individual providers about their performance (79.4%). We also found top-level management is more likely to attend external service quality training or conferences (54.4%) than front-line staff (31.5%).

The use of consultants (41.3%), creation of patient/family advisory councils or advisors (38.0%), and new financial incentives (29.4%) are also commonly reported changes since HCAHPS inception. We also found hospitals with relatively lower Achievement have a higher level of new training programs implemented ($p = 0.0004$), are likely bringing in more outside consultants to help ($p = 0.04$), and have implemented new service-oriented initiatives on patient-care units ($p = 0.001$). Overall, more total changes identified were associated with lower Achievement scores ($p = 0.005$).

Table 21: Hospital quality goals

	Efficiency	Patient Experience	Patient Safety	Outcomes	Quality
Most important	20.7%	7.6%	57.6%	4.3%	9.8%
Second most important	9.8%	16.3%	19.6%	17.4%	37.0%
Middle importance	14.1%	27.2%	9.8%	26.1%	22.8%
Second least important	14.1%	32.6%	12.0%	22.8%	18.5%
Least important	41.3%	16.3%	1.1%	29.3%	12.0%

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Table 22: Hospital motivation for improving the patient experience

	Improved patient care and outcomes	Increase in VBP reimbursement	Public reporting	Reputation and new patient acquisition	Lower malpractice risk
Most important	65.6%	16.7%	9.4%	6.3%	2.1%

Second most important	12.5%	33.3%	18.8%	33.3%	2.1%
Middle importance	15.6%	32.3%	21.9%	26.0%	4.2%
Second least important	4.2%	15.6%	34.4%	30.2%	15.6%
Least important	2.1%	2.1%	15.6%	4.2%	76.0%

Organizational motivation for patient experience improvements: Despite ongoing debate in the literature (see Manary et al. 2013 for a review), a strong majority (65.6%, see Table 22) of hospital respondents see the tie between patient experiences and better outcomes as the most important motivating factor for improving patient experiences. It is also apparent hospitals are not managing the patient experience for the purpose of minimizing lawsuits/malpractice claims (76.0% view this as least important).

Staff attitudes, teamwork, and culture in measuring and improving the patient experience: Given the importance of both physicians and nurses in determining the patient reported satisfaction (Boulding et al. 2011; Glickman et al. 2009), we asked respondents to characterize the attitudes of both physicians and nurses as they pertain to measuring and improving the patient experience. Physicians appear less supportive in general than their nursing counterparts, and are five times more likely than nurses to have neutral to very-opposed attitudes regarding measuring and improving patient experiences (27.3% vs. 5.5%, respectively). It is worth pointing out a potential disconnect between CEOs and the Board members, where 83% and 68% were identified as viewing management of the patient experience as “Extremely Important,” whereas only 14% of physicians and 32% of nurses believe it’s an integral part of delivering high quality care. Interestingly, hospitals where physicians are identified as being extremely supportive have Achievement rankings 6 percentage points higher than hospitals where physicians

are not extremely supportive ($p = 0.04$). We also found that in every case where physicians were identified as extremely supportive, nurses, the Board, and CEO were also all rated as being extremely supportive.

Physician and nurse attitudes were also correlated with the level of teamwork between administration and clinicians in improving the patient experience ($p < 0.0001$). Not surprisingly, hospitals whose administration and staff are characterized as highly collaborative with a common vision for the patient experience have Achievement rankings that are on average 3 percentage points higher than other hospitals ($p = 0.11$).

Respondents also reported on the overall culture of their hospitals. Our sample was fairly well distributed across cultures described as collaborative (39%), hierarchical (24%), and decentralized (30%). We found that collaborative cultures are associated with 3 percentage points higher Achievement rankings ($p = 0.08$), and are significantly correlated ($p = 0.0003$) with hospitals identified as having a very high level of teamwork between administration and staff. On the other hand, decentralized cultures are associated with a 5 percentage point lower HCAHPS Achievement ranking ($p = 0.01$).

Employees are also reported as being more highly satisfied in collaborative cultures ($p < 0.0001$) and less satisfied in decentralized ones ($p = 0.01$). Just as marketing researchers have found ties between employee satisfaction and customer satisfaction (Bernhardt and Donthu 2000; Maxham et al. 2008), we also found hospitals with

extremely satisfied employees are associated with an 8 percentage point higher Achievement ranking ($p = 0.04$).

Priorities in managing the patient experience: Table 23 displays the most important aspects to hospitals as it relates to managing the patient experience. Respondents indicated nursing communication (55.9%), responsiveness to patient requests (27.5%), and physician communication (12.7%) as being the most important areas in managing patient experiences. Despite anecdotal concerns that hospitals will increase investments in environmental amenities (Gluck 2011) to boost patient experience scores, our sample seems largely focused on the aspects that actually correlate with the highest returns on patient experience scores (Boulding et al. 2011; Glickman et al. 2009).³

³ We did not test this question on the Achievement and Improvement measures as 96% of respondents indicated physicians, nurses, or responsiveness were most important, all three of which are already shown to be empirically tied to the patient experience.

Table 23: Most important factors as it relates to managing the patient experience

	Physician communication	Nurse communication	Décor and amenities	Recovery planning	Responsive service	Room cleanliness
Most important	12.7%	55.9%	1.0%	2.0%	27.5%	1.0%
Second most important	36.3%	28.4%	1.0%	10.8%	18.6%	4.9%
Third most important	22.5%	7.8%	1.0%	21.6%	37.3%	9.8%
Third least important	16.7%	7.8%	2.0%	45.1%	13.7%	14.7%
Second least important	9.8%	0.0%	3.9%	19.6%	1.0%	65.7%
Least important	2.0%	0.0%	91.2%	1.0%	2.0%	3.9%

Barriers to improving the patient experience: When asked to identify the top barriers to improving the patient experience at their hospital, respondents overwhelmingly identified organizational barriers such as teamwork and care coordination (74.6%) and physician engagement (68.2%). We noted before that only 14% of physician attitudes were identified as believing the patient experience was an integral part of delivering high quality care, and that Achievement rankings were associated with physician attitudes. We also found Achievement rankings were 5 percentage points lower for hospitals where physicians were identified as a barrier ($p = 0.01$). Beyond the most commonly identified barriers, about a third (35.5%) identified nursing engagement. Limited science behind the utility of patient experience measures (17.3%), limited data quality (14.6%), lack of leadership commitment (12.7%), and inadequate measures (9.1%) were less frequently identified barriers to improving the patient experience.

5.3 Discussion

With the advent of HCAHPS, hospitals have become more aware of, and concerned with, managing the patient experience. Despite this, management has limited visibility into what efforts they take actually improve the patient-reported experience. Understanding the dynamics and actions associated with better patient experiences is becoming increasingly important for hospitals not only for delivering better care to

patients, but for the financial health of the institution. We have several noteworthy findings pertinent to those responsible for crafting strategic plans for managing and improving the patient experience.

Our respondents were all identified as being responsible in some way for managing the patient experience at their institution. These champions were well aware of their current Achievement, but largely lacked an understanding of how their organizations have performed with respect to patient experiences over time (i.e. Improvement). Despite hospitals, particularly poor performing ones, implementing changes to improve the patient experience it is not clear how they monitor the efficacy of those investments when they are unaware of their own performance trends. As such, management will need to monitor not only current Achievement rankings, but the longitudinal changes in HCAHPS scores to better understand what investments produce returns for the hospital.

Although our survey was not designed for longitudinal analysis, we did find some evidence that keeping the patient experience forefront in employees' minds and financially incentivizing performance may improve patient experience scores over time. Of the communication channels, electronic mail was the only one associated with greater Improvement in HCAHPS scores. This may reflect the increasing reliance employees place on technology to provide conduits of information. Although we did not survey the

frequency of communication channels, it is reasonable to suspect employees are receiving electronic communications no less frequently than, say, departmental meetings. Adoption of real-time electronic patient feedback systems, therefore, may become powerful and actionable tools in managing the patient experience. The use of financial incentives also appears to hold promise in improving the patient experience. However, despite the potential linkage between financial incentives and improved HCAHPS scores, hospitals – for any number of reasons – may find it difficult to deploy such programs. For instance, we found hospitals that offered employees financial incentives were positively correlated with higher institutional financial performance ($p = 0.02$). The financial health of the hospital may be a barrier to implementing the right incentives that lead to greater improvements in patient experiences. As VBP reimbursements increasingly rely on HCAHPS scores, this may present a potential downward spiral of financial health and patient experiences for those hospitals unable to initially afford implementing appropriate incentive systems.

We also found hospitals with lower current Achievement rankings are changing the way they approach the patient experience. It is clear from the results that hospitals with typically lower Achievement rankings are looking to improve them through the same avenues, namely, new training programs, hiring outside consultants, and implementing new service-oriented initiatives. Although we did not find a significant

relation between implementing these programs and improvements in HCAHPS scores, we do not know when the new initiatives were implemented. Therefore, it will be worth watching over the coming years if these strategies pay off with HCAHPS Improvements.

Physicians and their attitudes toward the patient experience appear to be a pivotal opportunity, or gate, to improving HCAHPS scores. Hospitals where physicians are extremely supportive of improving the patient experience also have higher Achievement scores. However, physicians overall appear to be reluctant to take a supportive view of managing the patient experience. Nurses, for example, are almost two-and-a-half times more likely than physicians to believe managing the patient experience is an integral part of delivering high quality care. Physician engagement was also identified as one of the key barriers to improving the patient experience - at a rate of nearly 2-to-1 over nurses - and where physicians were identified as a barrier Achievement scores were lower. In fact, we found when respondents identified physicians as a barrier to the patient experience, patients also scored the hospital's HCAHPS "Doctor Communication" Achievement ranking 16 percentage points lower ($p = 0.002$). We also had no cases where physician support for improving the patient experience was greater than nurses or executives, indicating physicians may be the last key care providers to get on board with managing the patient experience.

As others have found (Meterko et al. 2004), our results indicate high levels of teamwork between staff and administration is correlated with higher Achievement rankings. We find the same positive association between collaborative hospital cultures and Achievement rankings as well. In turn, cultures described as decentralized have lower Achievement rankings. This may be a reflection of the importance in having an environment where management consolidates and endorses the priorities of the hospital. However, this needs to be done without compromising collaboration as patients respond negatively to hospitals whose culture is defined by its employees as bureaucratic (Meterko et al. 2004).

5.3.1 Limitations

We recognize several potential limitations to our study. As with most studies, generalizability is a concern given our small sample size relative to the entire population of hospitals, and that the hospitals are all associated with a common network (VHA). However, we ran a battery of comparisons between our sample and a national population and found no significant difference in any of nine different performance measures. We also controlled our analysis for hospital characteristics such as bed size, teaching affiliation, and location.

It could be argued our respondents, as identified champions for the patient experience, are naturally biased in their views of the importance of managing the patient

experience. Therefore, their opinions may not accurately reflect their institution's reality. Ideally, we would have multiple responses from each hospital to minimize the concern. However, our analyses were based on comparing employee responses to the patient perspective through HCAHPS. Patient evaluations are clearly not influenced by the same occupational biases that our respondents may be subject to. We also note that our Achievement and Improvement scores are based on a release of HCAHPS that occurred 2 quarters after our respondents submitted their surveys, thus minimizing a potential for reverse-causality (i.e. respondents basing their opinions on culture etc. on HCAHPS).

Another important limitation is our lack of longitudinal measures. Having survey responses from different time periods would allow us to better understand how changes in hospital culture or actions impacts changes in patient experiences. It would also enable us to rule out the competing hypotheses we faced.

5.3.2 Conclusion

Hospital management faces many challenges and unknowns in delivering the best possible patient experiences. It appears, however, that certain strategies may show more promise than others. Keeping the patient's perspective in the forefront of employees' minds, whether through effective communication or monetary incentives, appears a key to performance improvement. Organizational culture, attitudes, and staff cohesion are inter-related facets that - in both summary and specifics - patients respond

to in the HCAHPS survey. Creating a collaborative, team-based environment with a common priority and vision for managing the patient experience - particularly with physicians - is a strategy likely to reap benefits, both for the patient and the hospital.

6. Concluding Remarks

Our studies attempted to address service research issues both far-reaching in scope and implication, as well as specific to the US healthcare industry. We began and ended with an investigation into the customer's perceptions of service quality. First, by determining the unique measure of quality customer perceptions provide beyond the technical competence of a service provider. And second, how the firm's organizational activities and attitudes toward managing the customer experience are in turn perceived by the customer.

Our choice of research field yielded a distinct advantage to our service quality research not utilized by marketers before: three measures of the service encounter reflecting the competence of the service provider, the inter-personal skill of the service provider, and a universally accepted measure of *ex-post* service quality. We utilized this trinity of measures to first explore the validity of customer perceptions of quality. We found customer perspectives are neither unrelated to ultimate quality, nor redundant to the technical competence of the service encounter. Instead, when collected by a well designed survey focused on experience elements (see Giordano et al. 2010 for a review) customers' perceptions of inter-personal aspects uniquely correlate with underlying quality (see Table 5). In fact, customers can perceive multiple unique dimensions of quality simultaneously (see Chapter 3, Table 10), and inter-personal dimensions are

often more telling of quality than technical competence (see Chapters 3 and 4, Tables 10, 13, and 14).

In addition, we found empirically what others have theorized; inter-personal service is the foundation by which technical competence is delivered. We found that in the interaction effect of our national sample of hospitals in Chapter 4 (see Table 14). This inter-dependent relationship will be surprising for many in the healthcare field who hold to traditional view that technical competence is king in quality measurement, but it also has potentially disruptive implications for marketing service quality researchers. Whether in marketing or healthcare research, precluding one of the dimensions of care now has the distinct problem of omitted variable bias. Marketing research that is unable to account for the technical quality of service and instead relies solely on the customer perspective may over (under) state the impact of the customer perspective.

And omitting one of the two dimensions can hamper managerial insights. The interactive effect of technical and inter-personal facets of service indicates optimal investments in service quality improvements are conditional on the state of both dimensions. Put another way, the return a manager may expect from investments to increase evaluations of inter-personal care are dependent on the level of technical competence the service staff provides, and vice versa. Other marketers have found conditions under which investments in service quality are sub-optimal (Hill 1993; Rust

and Zahorik 1993; Rust et al. 1995). Our findings add to prior research in that omission of either dimension of service quality will bias expected returns and may turn what appears a sound investment in service quality into an underperforming expenditure.

Several of our results were more specific to the US healthcare field. For instance, we found the unique nature of payment in the US healthcare field complicates the natural relation between a firm's investments in service quality and the returns they may receive to further invest in quality (see Figure 6 and Tables 13, 15, 17, and 18). Under a normal free-market condition, firms that provide superior service reap greater profits which in turn can be reinvested in further improving service quality. As Rust et al. (1995, pg. 59) note, "Quality improvement in services thus increasingly implies spending on quality to improve revenues rather than reduce costs." However, if customer revenue increases are not commensurate with quality improvements (and the associated expense), management then faces a dilemma: when faced with a patient demographic tied to lower economic returns, will efforts to improve quality lead to financial ruin? Policy makers (who also happen to be the single largest payer in the hospital system) would prefer quality be high and constant across all customer populations. Ironically, in their desire to keep taxpayer expenditures down, the very pols wanting equality in quality are contributing to the problem by financially pressuring the hospitals most reliant on them through lower reimbursement rates. The

studies we conducted did not address the obvious conundrum facing policy makers: can the government simultaneously keep expenditures down, be equitable to hospitals that struggle to provide better care due in part to the government's lower reimbursements, yet not institutionalize different acceptable tiers of service quality based on payer mix?

Although managing the customer experience has long been a pillar of service quality principals in marketing, practitioners in healthcare continue to resist elevating the customer experience to parity with traditional perspectives of quality, such as technical competence. Our survey results indicate management may face a cultural battle in bringing their organizations around to viewing the patient experience as an integral part of delivering high quality care, particularly for the physicians within their institutions. However, the tide of sentiment is turning in healthcare as empirical evidence mounts (Friedburg et al. 2012) that the customer perspective is a valid, informative, and actionable measure of service quality.

Appendix

VHA-UNC Patient Experience Survey

Q1 What is your role at your hospital? (Please check all that apply)

- Chief Executive Officer (1)
- Chief Medical Officer (2)
- Chief Operating Officer (3)
- Chief Nursing Officer (4)
- Chief Experience Officer/Patient Relations Officer (5)
- Chief Marketing Officer (6)
- Chief Quality Officer (7)
- Department Chair/Division Chief (8)
- Staff Physician (9)
- Staff Nurse (10)
- Quality Improvement Professional (11)
- Other (please specify) (12) _____

Q2 How have your HCAHPS scores changed over the past 3 years relative to other hospitals nationally?

- They have increased much faster than other hospitals (1)
- They have increased somewhat faster than other hospitals (2)
- They have stayed about the same as other hospitals (3)
- They have increased, but at a somewhat slower rate than other hospitals (4)
- They have significantly lagged improvements at other hospitals (5)
- N/A – We do not participate in HCAHPS (6)

Q3 How do your HCAHPS scores now (i.e. this year) compare to other hospitals nationally?

- Much better (1)
- Somewhat Better (2)
- About the Same (3)
- Somewhat Worse (4)
- Much Worse (5)
- NA - We do not participate in HCAHPS (6)

Q4 What other approaches besides HCAHPS does your hospital use to measure the patient experience?

- Commercial patient satisfaction vendor (please specify which one): (1)

- Internally developed patient satisfaction measurement program (2)
- None (3)
- Other (please specify): (4) _____

Q5 How is information about the patient experience (i.e. HCAHPS scores) disseminated within your organization? (Please check all that apply)

- E-mail (1)
- Other internal communications (internal website, posters) (2)
- Departmental meetings (3)
- System-level leadership meetings (4)
- Notices on patient units (5)
- Other (please specify): (6) _____

Q6 What types of incentives does your organization use for improving patient satisfaction/experience scores? (Please check all that apply)

- Financial bonuses for individual providers (1)
- Financial penalties for individual providers (2)
- Financial bonuses for departments/service lines (3)
- Financial penalties for departments/service lines (4)
- Public recognition of high performing individuals/service lines (5)
- Detailed performance evaluations (individual providers) (6)
- None (7)
- Other (please specify): (8) _____

Q7 Please describe the degree to which your organization holds individuals accountable for improving and managing the patient experience.

- Extremely – everyone knows their role and has personal accountability (1)
- Somewhat – most people know their role and are held accountable (2)
- Neutral – some people know their role and are held accountable (3)
- Not really – few people know their specific role or are held accountable (4)
- Not at all – nobody knows their role or are held accountable (5)

Q8 How often do you discuss your patient experience efforts or data at senior leadership meetings?

- Once a week (1)
- Once a month (2)
- Quarterly (3)
- Seimanually (4)
- Once a year (5)
- Never (6)
- Other (please specify): (7) _____

Q9 Do you share your HCAHPS or patient satisfaction data with your Board?

- Yes (1)
- No (2)

Q10 Please rate your Board's commitment to measuring and improving the patient experience.

- Extremely important (1)
- Somewhat important (2)
- Neither important or unimportant (3)
- Somewhat important (4)
- Very unimportant (5)

Q11 Please rate your CEO's commitment to measuring and improving the patient experience.

- Extremely important (1)
- Somewhat important (2)
- Neither important or unimportant (3)
- Somewhat important (4)
- Very unimportant (5)

Q12 Please rank all of the following quality goals in order of importance. The ranking should reflect your organization's commitment and overall managerial effort to these areas (1= most important, 2=second most important, 3=third most important, etc)

_____ Efficiency (i.e. costs, length of stay, etc) (1)

_____ Patient experience (i.e. "Satisfaction") (2)

_____ Patient safety (i.e. hospital acquired infections, never events) (3)

- _____ Outcomes (i.e. 30-day mortality, readmission rates) (4)
- _____ Quality (i.e. adherence to clinical performance measures) (5)

Q13 What type of changes has your organization undertaken since HCAHPS began measuring the patient experience? (Please check all that apply)

- Raised awareness among staff through internal communications (1)
- Implemented new training programs for physicians, nurses, and staff (2)
- Hired outside consultants (3)
- Created new incentives (financial) within the organization (4)
- Implemented new service-oriented initiatives on patient care units (5)
- Created patient/family advisory councils or advisors (6)
- None (7)
- Other (please specify): (8) _____

Q14 What types of training do you provide for your employees on service quality? (Please check all that apply)

- Internally developed training programs for top level management (1)
- Internally developed training sessions for front line staff (2)
- External training sessions or conferences (i.e., IHI, Studer Group, Advisory Board, Beryl Institute) for top-level management (please specify which ones): (3)

- External training sessions or conferences (i.e., IHI, Studer Group, Press Ganey, outside consultants) for front-line staff (please specify which ones): (4)

- Feedback to individual providers about their performance (5)
- None (6)
- Other (please specify): (7) _____

Q15 What is your organization's motivation for improving the patient experience? Below are a number of possible motivations. Please rank all 5 in order of importance (1=most important, 2=second most important, 3=third most important, etc)

- _____ It leads to better patient care and health outcomes (1)
- _____ Increase in reimbursement for good HCAHPS patient experience scores (2)
- _____ The HCAHPS data are publicly reported (3)
- _____ It will help us attract new patients and enhance our reputation (4)

_____ It leads to lower malpractice risk (5)

Q16 How would you characterize the overall attitudes of physicians within your organization towards measuring and improving the patient experience?

- Extremely supportive - they firmly believe it's an integral part of delivering high quality care (1)
- Somewhat supportive (2)
- Neutral (3)
- Somewhat against (4)
- Very opposed – they view it as a real nuisance and don't see the value (5)
- Other (please specify): (6) _____

Q17 How would you characterize the overall attitudes of nurses within your organization towards measuring and improving the patient experience?

- Extremely supportive - they firmly believe it's an integral part of delivering high quality care (1)
- Somewhat supportive (2)
- Neutral (3)
- Somewhat against (4)
- Very opposed - they view it as a real nuisance and don't see the value (5)
- Other (please specify): (6) _____

Q18 How would you characterize the level of teamwork between administration and clinicians at your hospital in improving the patient experience?

- Very high - they are highly collaborative and share a common vision (1)
- High (2)
- Neutral (3)
- Low (4)
- Very low - they are at odds about managing the patient experience (5)

Q19 What areas are most important to your organization as it relates to managing the patient experience? Please rank all 6 of the following in order of importance (1=most important, 2=second most important, 3=third most important, etc)

_____ Care and communication from doctors (1)

_____ Care and communication from nurses (2)

_____ Décor and amenities of the hospital (3)

- _____ Discharge instructions planning (4)
- _____ Responsiveness to patient to requests (i.e. call-bell, pain medication, etc) (5)
- _____ Room cleanliness (6)

Q20 What are the biggest barriers to improving the patient experience at your organization? (Please check the top 3)

- Physician engagement (1)
- Nursing engagement (2)
- Lack of commitment by hospital leadership (3)
- Organizational/Cultural barriers – i.e. lack of teamwork and care coordination (4)
- Limited science behind the utility of patient experience measures (5)
- Inadequate measures (6)
- Limited data quality (i.e. low response rates, incomplete data, etc. (7)
- Other (please specify): (8) _____

Q21 How would you best characterize the culture of your organization?

- Group oriented and collaborative (1)
- Hierarchical, i.e. Top-down (2)
- Decentralized, i.e. departments/physicians have considerable autonomy (3)
- Competitive, i.e. a department is compared relative to other departments within the organization (4)
- Other (please specify): (5) _____

Q22 Does your organization conduct an employee satisfaction/engagement survey?

- Yes (1)
- No (2)

Q23 Please characterize the overall level of employee satisfaction within your organization:

- Extremely satisfied (1)
- Somewhat satisfied (2)
- Neutral (3)
- Somewhat dissatisfied (4)
- Extremely dissatisfied (5)

Q24 What new program/innovation have you implemented at your organization that has led to the most meaningful improvements in the patient experience?

Q25 Do you have any suggestions for the research and/or policy communities to help improve how we assess the patient experience? (e.g. use of focus groups, wider distribution of patients surveyed, more frequent surveys, etc).

Q26 Please indicate if you would like to receive a copy of the survey results:

- Yes (1)
- No (2)

Q27 Do we have permission to follow-up with you by e-mail if we have further questions about your survey responses?

- Yes (1)
- No (2)

Q28 Ideally we would like to obtain two respondents at each organization who manage the patient experience- one clinical (MD/RN) and one administrative (c-suite). Would you provide us the name and e-mail address of a second contact person within your organization that we can send the survey to? Ideally, if you are an administrative person (i.e. c-suite role) then the second contact should be a clinical (i.e. MD/RN) respondent or vice-versa.

Name of second contact (1) _____

E-mail address of second contact (2) _____

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Biography

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