

Management Accounting and Control in the Hospital Industry: A Review

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ABSTRACT: This paper presents an overview of the literature in management accounting and control systems (MACS) in the hospital industry. A unique feature of the hospital industry in several countries is not only the coexistence of different ownership forms (such as nonprofit, for-profit, and government), but also diversity within a specific form (such as religious, secular, and university nonprofit hospitals). Organizational objectives and the operating constraints faced by various types of hospitals differ in this “mixed” industry. As a result, one unifying or grand theory is unlikely to provide sufficient insights to understand hospital behavior, especially with respect to MACS design and outcomes. Additionally, the industry has witnessed a variety of regulatory changes, which are primarily aimed at reducing healthcare costs and increasing access. These regulatory changes influence every aspect of MACS. Finally, hospitals face institutional constraints, which have implications for MACS design and use. We review the MACS literature in the hospital industry and identify opportunities for future accounting research.

Keywords: *healthcare; management accounting; regulation.*

INTRODUCTION

Management accounting and control systems (MACS) provide information for planning, decision making, and motivating employees to make goal-congruent effort choices (Demski and Feltham 1979; Luft and Shields 2007; Sprinkle 2003; Zimmerman 2001). Literature in MACS uses a variety of theoretical frameworks and empirical methods to systematically examine problems that arise in complex institutional settings. This paper reviews MACS within the context of the hospital industry. We discuss unique features of the hospital industry such as ownership patterns, regulation, competition, and institutional pressures, and their

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implications for accounting. We also outline current developments in healthcare and identify opportunities for accounting researchers interested in studying nonprofit, for-profit, and governmental institutions. The distinctive features of the hospital industry can be utilized to test a variety of theoretical frameworks related to the design and use of MACS. This dynamic and important industry, with its mosaic of ownership types and governance styles, has the potential not only to enable theory *testing* in MACS, but also theory *building* in the area of government and nonprofit accounting.

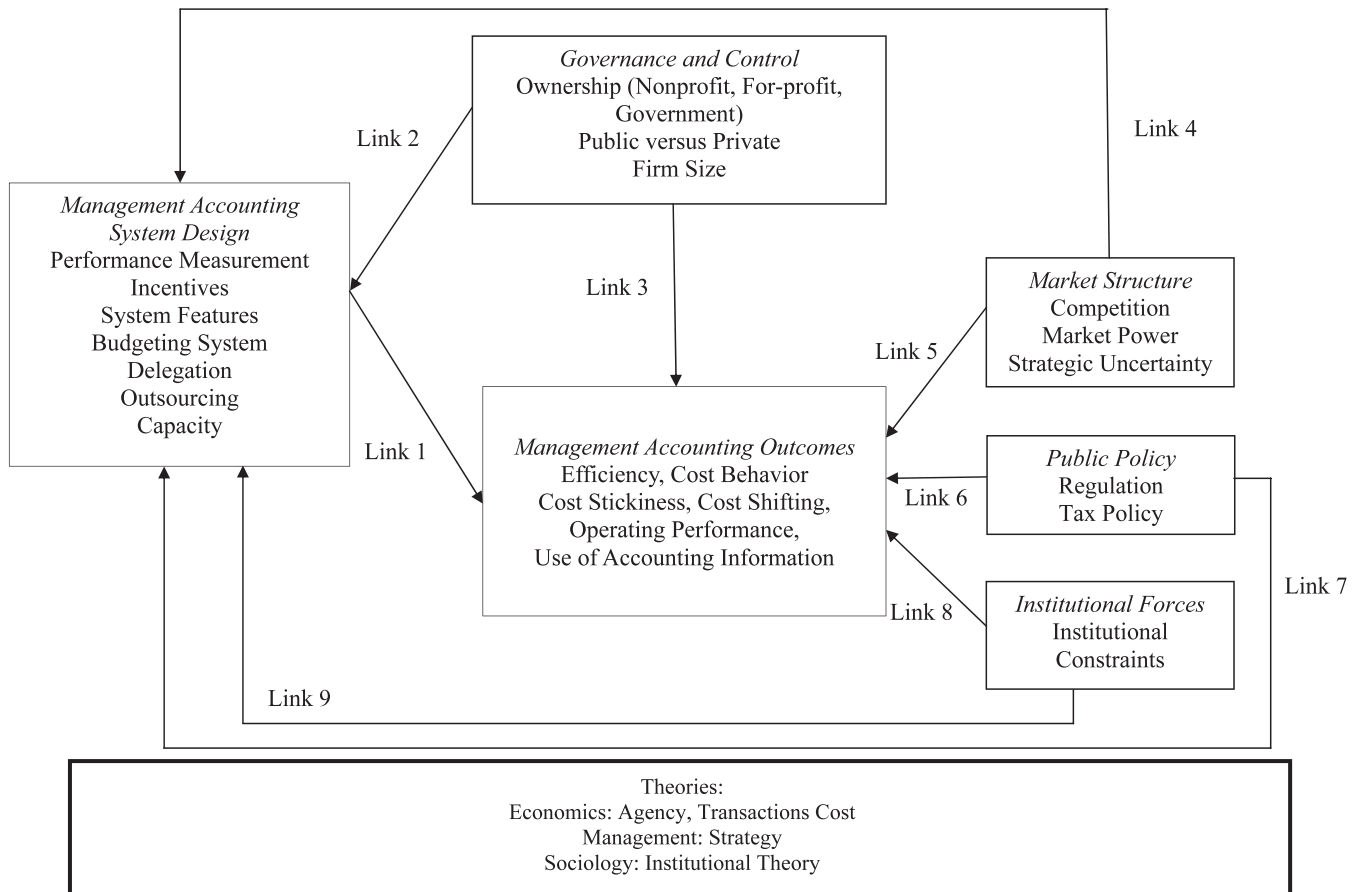
We begin with an overview of the hospital industry to identify key factors that influence hospital cost and revenue functions. We cluster these factors into three groups: ownership and objective functions, regulatory factors, and institutional constraints. With respect to ownership, the hospital industry is characterized by the coexistence of nonprofit hospitals (NFP), for-profit hospitals (FP), and government hospitals (GH). While FP can distribute hospital earnings to their residual claimants, the IRS and state governments monitor and restrict such behavior in NFP. Additionally, GH are required to remit any surplus to supervising agencies. These differences introduce a unique set of incentives related to cost and revenue management. Because NFP and GH do not have a standard set of “owners” (such as shareholders), modifications are required to standard economic theories that are routinely employed in accounting research (Vermeer, Raghunandan, and Forgiione 2009a). Hospitals operate in the context of a dynamic and complex regulatory environment that influences every aspect of cost and revenue functions. Ownership has implications for the mechanisms that hospitals can employ to respond to regulations. For example, FP can respond to regulation by altering their product portfolios, while NFP and GH have less flexibility for such actions. Finally, hospitals operate in a complex institutional environment where institutional pressures accrue differently to different ownership types. While FP are more market driven, NFP and GH are expected to be more mission driven.

Our review indicates that MACS in the hospital sector are characterized by a rich diversity of theories and methods. This is a departure from accounting research that uses data from publicly traded corporations, which is dominated by an economic lens. We offer a framework to organize the factors that influence MACS design and outcomes in hospitals. Our review indicates that certain links in the framework are extensively studied, while other links remain sparsely studied. We introduce some ideas for future research to address these research gaps. The intent is to begin a dialogue about creative use of theories, methods, and industry settings to stimulate accounting research related to MACS in for-profit, government, and nonprofit organizations.

FRAMEWORK OF HOSPITAL MACS

Figure 1 contains a proposed framework of the key drivers and consequences of hospital MACS. The starting point for the framework is MACS design. Link 1 captures variations in MACS design and their implications for MACS outcomes. Link 2 examines the role of governance and control in MACS design, while Link 3 examines MACS outcomes. Links 4 and 5 relate to the effect of market structure, Links 6 and 7 explore the role of regulation and public policy, while Links 8 and 9 examine institutional pressures and MACS design and outcomes. The studies that comprise these links draw on an eclectic mix of theoretical perspectives, including economics, sociology, management, and strategy. Some studies test theory-driven hypotheses, while others have more direct relevance to practice, such as the study of activity-based costing in hospitals. The framework excludes topics whose primary goal is to examine financial accounting, auditing, or tax issues in hospitals. We also restrict the literature review to accounting journals.

FIGURE 1
Accounting Research in Hospital Settings
Theoretical Frameworks and Topics



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Appendix A provides a sample of the articles that study the links in Figure 1. The following can immediately be observed. First, a substantial number of the articles encompass more than one link. Therefore, although we attempt to discuss the literature linearly by link, considerable slippage into other links is inevitable. Second, research has used a variety of theoretical frameworks to explore the links. Finally, two factors—i.e., variations in ownership and regulatory changes—have spurred far more research than others. Therefore, we begin our review by a discussion of ownership and regulation factors, followed by an outline of the theoretical frameworks employed. Subsequently we perform a link-wise discussion. Table 1 summarizes the important elements of the theoretical frameworks used to study the links.

Ownership Variations

One of the unique features of the hospital industry is the presence of competing hospitals with similar production functions but different ownership forms. This feature has generated considerable interest in accounting because ownership influences the importance of profits to the objective function, which would affect MACS elements such as design of managerial incentive

TABLE 1
Theoretical Approaches to the Study of MACS

Organizational Mechanisms	Agency Theory (1)	Transaction Cost Economics (2)	Institutional Theory (3)
Organizational objective	Maximization of shareholder welfare is the primary optimization problem.	Goal alignment within the firm and across firms via norms, expectations, and trust to reduce opportunistic behavior.	Goal alignment via norms, expectations, and standard operating procedures.
Governance mechanisms	Professional governance with a focus on owner profit maximization. Alignment through incentive contracting.	Cross-board membership and information sharing.	Broader stakeholder representation on the board and processes with symbolism and routines.
Roadblocks to organizational efficiency	Agency problems arise between economically rational agents due to information asymmetry.	Contracts are incomplete and unenforceable, due to transaction costs.	Trade-offs among multiple objectives as managers are constrained by external institutional pressures and organizational routines in addition to economic considerations.
Potential solutions	Solutions for agency problems through contracting mechanisms such as truth-inducing contracts.	Relationship contracting, trust building, collaboration, and vertical integration.	Organizational norms and ceremonial structures.
Managerial selection	Competitive compensation practices and tournaments used to identify the most talented managers.	Collaborative relationship-oriented managers.	Self-selection of managers with additional non-pecuniary motives such as altruism and desire for stability.
Managerial characteristics	Assumes self-interested managers.	Allows for the effects of cooperative managers.	Allows for the effects of altruistic managers.
Risk sharing	Trade-off between efficient risk sharing and total welfare maximization.	Cooperation and information risk-sharing arrangements.	Risk sharing through protection from adverse outcomes and soft budgets.
Pay-for-performance contracting	Contracts based on financial performance to align principal and agent goals—complete and costless contracting assumed.	Less incentive intensive, greater use of collaboration.	Less use of performance-based contracting. Internalization of organizational expectations.
Demand for accounting information	Contracting and monitoring, dealing with asymmetric information problems.	To facilitate negotiations and help reduce contract incompleteness.	Legitimizing operations to external entities in addition to monitoring.

contracts. Economic theory suggests that FP managers are incentivized to develop profit-creating strategies and respond quickly to changing environmental conditions. In contrast, GH are less responsive to market-driven financial pressures because both politics and economics affect funding from legislatures and other agencies. GH are usually operated by federal, state, county, or municipal governments. Federal hospitals include veterans' and military hospitals. State hospitals include teaching hospitals operated collaboratively with a university. Counties often operate hospitals located in larger cities within the counties. In rural areas, municipal districts own and operate hospitals. GH have multi-dimensional objective functions including delivering unprofitable services, caring for indigent populations, and providing community-based health education programs and outreach. These social objectives are likely to be shared by hospital managers and weaken the power of financial incentives (Tirole 1994). CEOs in GH rarely have performance-based compensation contracts because they function as heads of government agencies. District hospital CEOs are compensated significantly less than their nonprofit counterparts (Eldenburger and Krishnan 2003). GH report to a supervising agency rather than a governing board, except for municipal district hospitals, which tend to have a small governing board of elected members (Eldenburger, Hermalin, Weisbach, and Wosinska 2004). Board meetings in GH are public. Some stakeholders have preferences for expanded services, unrestrained access, and high quality, while others argue for fiscal restraint and stewardship of tax dollars. GH are subject to soft-budget constraints, that is, when hospital income exceeds budget targets, the excess does not remain at the hospital level but is added to the overseeing agency's funds. Conversely, when the hospital experiences income shortfalls, it will be bailed out by the overseeing agency (Duggan 2000).

NFP exhibit characteristics of both FP and GH. Churches, community-based foundations, and physician groups provide capitalization for NFP, rather than investors. Like GH, their mission statements include social objectives. However, unlike GH, these hospitals are self-sustaining organizations and can rarely rely on subsidies for operations (Balakrishnan, Eldenburger, Krishnan, and Soderstrom 2010). Although NFP can earn accounting profits, no shareholder or other entity has a claim on the residual profit (Conrad 1984; Forgione 1999). Instead, stewardship of resources is a primary objective, which gives rise to the need for fund accounting (Forgione 1999). The non-distribution constraint is interpreted as though NFP *should not* earn a return, which can lead to suboptimal decisions. Conrad (1984) argues that competitive pricing and allowing a return on investment would assist NFP in making optimal investment decisions. The non-distribution constraint also stymies NFP from structuring incentive-based compensation plans with hospital CEOs. However, with regulatory changes that increased financial risk, over the last two decades NFP have increasingly used compensation contracts that link pay to performance to encourage managers to reduce costs and increase revenues (Lambert and Larcker 1995; Eldenburger and Krishnan 2008). Increased use of incentive contracting encourages NFP managers to act more like FP (Leone and Van Horn 2005). The governing boards for NFP tend to be larger than FP and include representatives of various stakeholder groups such as church, physicians, or community activists (Eldenburger et al. 2004). Indeed, the relationship between NFP and their boards rarely conforms to the standard tenets of agency theory (Vermeer, Raghunandan, and Forgione 2006, 2009b). Overall, there is no "dominant" hospital ownership form. Relative power structures have created a unique ecosystem that has little parallel with other regulated industries.

Regulatory Changes

In many countries such as the U.S., Germany, Taiwan, and elsewhere, healthcare has undergone major regulatory changes that have altered revenue functions and financial risk, and

influenced all aspects of hospital MACS. Both regulatory and normative pressures require that hospitals provide high-quality care to patients regardless of ability to pay. At the same time, hospitals are expected to remain financially viable. This combination of welfare, professional, and commercial characteristics adds significant complexity in designing MACS to motivate and monitor the performance of hospital managers. While many of the regulatory changes in the past few decades have been substantial, in this section, we confine our discussion to two—the Prospective Payment System (PPS), and the Patient Protection and Affordable Care Act of 2010 (ACA). The PPS is important because it placed MACS research related to hospitals on the “map” with respect to prominence and importance. The ACA, which to date remains in a thorny position with respect to its likely future, has introduced incentives and reporting requirements that are pertinent to MACS design and use that are yet to be explored.

The Prospective Payment System

Patients covered by public insurance programs, such as Medicare and Medicaid in the U.S., are a major source of revenue for hospitals.¹ Prior to 1983, U.S. hospitals were reimbursed for Medicare patients under a cost-plus system. The dominant institutional logic prevailing during this period was to maximize quality of care and equity of access (Scott, Ruef, Mendel, and Caronna 2001). Hospitals had no incentives to control costs because there were no competitive, professional, or regulatory controls on cost. Demand for medical services is generally price inelastic; this inelasticity was further compounded by the fact that the payor for medical services was the insurance company and not the patient. Patients had incentives to overuse healthcare facilities. Volume of patients was critical to hospitals; in turn, hospitals competed to offer superior technology and extensive services to attract doctors and their patients (Robinson and Luft 1985; Noether 1988; Keeler, Melnick, and Zwanziger 1999). Hospitals had little incentive to invest in refined accounting systems because cost management was not a priority (Hill 2000). Hospitals designed their accounting systems to conform to the reporting systems prescribed by regulators, which resulted in a proliferation of transaction-oriented systems catering to individual departmental needs (Grandia 2016).

In 1982, the Prospective Payment System (PPS) was introduced for Medicare patients. The PPS classified each Medicare inpatient into diagnosis-related groups (DRGs).² Hospitals were paid a flat fee per DRG, depending on standardized estimates for treatment costs related to the DRG. The PPS changed risk allocation completely with the risk of cost overruns transferred entirely to the hospital. Hospitals now faced an increased risk of financial default, which was exacerbated because of high fixed costs. Almost all aspects of hospital operations were affected by the PPS, leading to substantial changes in MACS. The PPS made the economic viability of hospitals much more dependent on their ability to be efficient to ensure that costs were below the fixed fee, which increased the importance of disaggregated cost information for decision making. The PPS also encouraged hospitals to identify and grow revenues from non-Medicare patients (Lambert and Larcker 1995). Economics, management, and healthcare research has examined

¹ Medicare is a public insurance program for individuals 65 years of age, or individuals with certain types of disabilities. Medicaid is a federal/state program that provides insurance coverage to low-income adults and children. Together, about 31 percent of the U.S. population was covered under these two programs in 2010. About 55 percent of hospital revenues are from these two programs (Center for Health Affairs 2013).

² DRGs are groupings of patients with similar medical conditions. Each DRG is assigned a relative weight based on the level of average resources required for patient treatment. DRG reimbursement systems were adopted not only by Medicare, but also by various other public and private insurance programs (Folland, Goodman, and Stano 1997).

the effects of the change in regulation from cost-plus to fixed price on hospital behavior on prices, quality, length of stay, product mix, and governance (Dranove, Shanley, and White 1993; R. Krishnan, Joshi, and H. Krishnan 2004; Meltzer, Chung, and Basu 2002; Zwanziger and Melnick 1988). Accounting literature provides evidence that regulatory changes influenced cost allocation, cost shifting, and cost behavior (Link 6).

Affordable Care Act

The Affordable Care Act (ACA) was passed by the U.S. Congress in 2010, and went into effect in 2014. The goals of the ACA were to expand access to healthcare coverage, increase consumer protection, emphasize prevention and wellness, promote evidence-based treatment, and increase administrative efficiency to curb healthcare costs. Three features of the ACA have implications for accounting research. First, the ACA requires all U.S. residents to have some form of health insurance, either from their employer or from a public program such as Medicaid or Medicare (Vitalari 2014). Second, electronic health insurance exchanges under the ACA provide cost sharing incentives and a marketplace to buy individual health insurance policies. For hospitals, this could reduce the number of uninsured patients, which would improve revenues and margins. The ACA proposes a reduction to Medicaid Disproportionate Share Hospital payments (DSH).³ This can adversely affect safety-net providers whose loss of subsidies may exceed the gain in revenue from the newly insured patients. Safety-net hospitals and other hospitals that serve a disproportionate share of the uninsured may try to alter their cost functions by increasing cost flexibility and changing their product mix profile. Third, The ACA introduced incentives for quality of care and for disclosure. Hospitals are provided incentives or charged penalties for poor quality care, such as failure to comply with standardized processes, or poorer medical outcomes such as mortality or readmission rates. Although healthcare quality has been important, hospitals now must place even greater emphasis on quality. Thus, hospitals may explore nonfinancial performance measures and increase the incentives to providers for quality of care.

Theories Used to Examine Hospital MACS

Research has employed a variety of frameworks to study hospital MACS including agency theory, transaction cost economics, institutional theory, and management and strategy theories such as resource dependency theory.

Agency Theory

Contracting and managerial compensation in hospitals has made extensive use of an agency lens. Agency theory focuses on contract choices made *ex ante* between owners (principals) and managers (agents) and the systems that provide information to enforce these contracts to maximize the owner's welfare. The owner delegates tasks to a risk-averse manager, who could obtain private information subsequent to signing a contract (information asymmetry). The outcome is a function of the manager's unobservable effort, and the manager is assumed to be effort averse.

An agency-based design of contracts assumes that both the principal and the agent are rational, self-interested, and have unlimited computational abilities (Baiman 1990). Accounting information is required for contracting in the presence of information problems, for monitoring operations, and to determine rewards in the *ex post* settling-up process. Risk-sharing contracts,

³ Disproportionate Share Hospital (DSH) payments are federal subsidies to qualifying hospitals that serve many Medicaid and uninsured individuals.

developed to reduce efficiency losses from self-interested behavior, should also enable the organization to identify and attract talented managers (Demski and Feltham 1979). Table 1 (Column (1)) summarizes the important features of agency theory, including potential agency-based solutions to contracting problems.

Agency theory provides optimal solutions derived from a systematic modeling approach, which can be used to generate testable empirical propositions. However, agency theory often employs simplifying assumptions, which are necessary for analytical tractability but reduce generalizability of the results. Optimal contracts developed in agency models are sensitive to the model's assumptions and may not reflect the complexity of contracts found in organizations. In addition, agency theory assumes that contracts are complete, enforceable in courts of law, and have no transaction costs. However, contracting between physicians and HMOs or hospitals often gives rise to substantial transaction costs, including the administrative costs related to contracting, coordination, and control of the relationship. Transaction cost economics (TCE) relaxes some of the assumptions underlying agency theory and provides an alternate lens to examine hospital MACS (Cuellar and Gertler 2006).

Transaction Cost Economics

TCE assumes that uncertainty, bounded rationality, and the presence of relation-specific assets makes contracts inherently incomplete (Table 1, Column (2)). Uncertainty gives rise to expensive *ex post* renegotiations and adaptation costs. Relation-specific assets, i.e., human or physical assets that do not have a value outside a specific relationship, such as knowledge capital or specific types of components that only fit one product, give rise to the likelihood that one party will appropriate a larger share of the surplus. Agency models assume unlimited computational abilities. However, bounded rationality restricts managers' ability to acquire and process information efficiently. As a result of contract incompleteness, TCE assumes that courts cannot enforce contracts perfectly (Baiman 1990; Shelanski and Klein 1995; Williamson 1975). Establishing governance and control systems to use when future contingencies arise that are not covered in the contracts can reduce the losses from contract incompleteness. Collaboration, trust, and relational contracting can improve contractual outcomes. Accounting literature has explored governance and control mechanisms to mitigate contracting hazards and strengthen relational contracting (e.g., Anderson and Dekker 2005; Baiman and Rajan 2002).

TCE is a particularly relevant lens to examine hospital MACS. Hospitals are characterized by continuous and complex transactions between providers, patients, insurance companies, and other groups (Stiles, Mick, and Wise 2001). Some of these transactions occur within the firm, others in markets, and others in loosely formed collaborations. The TCE framework provides valuable insights to explore critical issues such as whether to keep a service within the hospital or to outsource.

Since its primary focus is economic efficiency, one limitation of TCE is that it does not consider differences that arise in contracting within and across firms due to sociological influences (Granovetter 1985; Roberts and Greenwood 1997). Sociological influences are especially relevant to this industry because of the nature of the service provided, the influence of a variety of stakeholders, and ownership differences that influence institutional pressures (Scott et al. 2001).

Institutional Theory

Beginning with the seminal work by Meyer and Rowan (1977), research in sociology, strategy, organizational theory, and management has recognized the importance of institutional constraints on firms' decisions, choices, and responses to internal as well as external pressures. Institutional

constraints include coercive, normative, and cognitive constraints on economic activity. Such constraints emerge from formal elements such as regulations, rules, and laws, informal elements such as sanctions, customs, traditions, and codes of conduct, and cognitive elements such as the belief systems and the cultural framework of organizational actions (North 1990; Rued and Scott 1998). Institutions constrain hospital behavior by identifying legal, moral, and cultural boundaries, which must be balanced in all aspects of decision making. Hospitals that conform to institutional pressures are rewarded through increased legitimacy, as well as stability and resources when faced with hardships (Meyer and Rowan 1977; North 1990; Scott 2001). While conformance to institutional pressures can provide economic benefits to organizations, such forces do not arise from an exclusive consideration of economic costs and benefits. Table 1 (Column (3)) summarizes the basic features of institutional theory including the organizational objectives, roadblocks, and potential mitigating mechanisms. Institutional theory is particularly relevant to the healthcare sector because it provides an organizing framework to predict and explain differences in organizational outcomes based on variations in ownership and governance.

Management and Strategy Theories

In recent years, researchers have employed resource dependency theory (RDT) to examine hospital behavior. Munificence, dynamism, and competition are the central tenets of RDT (Yeager et al. 2014). These three forces have a profound impact on how organizations manage their interactions with the environment. RDT posits that environmental uncertainty exposes organizations to risks that can lead to instability of cost and revenue functions. To mitigate some of the uncertainty, managers seek strategies to reduce dependence on the environment (Miller 1987; Pfeffer and Salancik 1978). Munificence is the availability of resources required for an organization's survival and growth (Dess and Beard 1984). Hospitals operating in less munificent financial and human resource environments employ relatively inexpensive and less labor-intensive technologies (Menachemi, Shin, Ford, and Yu 2011). Dynamism refers to the rate of environmental change (Dess and Beard 1984; Miller 1987), which introduces unexpected performance variability. Potential responses include collaborating with suppliers, mergers and acquisitions, and vertical integration. Yeager et al. (2014) review 20 major studies that apply RDT to healthcare organizations and find that these studies use a wide range in variables to measure the environment and environmental constructs.

RDT has been applied to the study of NFP organizations and their boards (Vermeer et al. 2006, 2009a, 2009b). Vermeer et al. (2006) examine the factors driving the composition of NFP audit committees. Audit committees play an important monitoring role, which has been examined within the context of the agency problems that exist between shareholders or creditors and managers. The agency framework is an uneasy fit for NFP because their objective functions are not focused on profit maximization. Vermeer et al. (2006) use RDT to test hypotheses related to the composition of NFP audit committees. Vermeer et al. (2009b) find that the working relationship between the audit committee and the external auditors conforms to RDT. They find that resource dependencies, presence of debt, audit quality, audit tenure, and organizational size influence the relationship between the audit committee and the external auditors. RDT offers an alternative lens to study healthcare organizations.

REVIEW OF LITERATURE IN HOSPITAL MACS

This section provides an overview of literature in hospital MACS organized by the links in Figure 1.

MACS Design and Outcomes (Link 1)

Hospital data have been employed to test a variety of topics related to Link 1, such as the use of cost information by decision makers, behavior of hospital costs, drivers of hospital costs, and budgeting. An example is [Eldenburg \(1994\)](#), who posits that although a majority of costs are driven by physicians' decisions, aligning a hospital's cost reduction goals with those of physicians' goals is complicated because physicians are not traditional "agents" in the same sense as managers in a for-profit corporation. That is, a hospital is essentially "two firms in one," as modeled by [Harris \(1977\)](#). [Eldenburg \(1994\)](#) models a physician's utility function as comprised of three components—utility for patient benefit, income, and disutility for being detected by other physicians as an over treater. This model leads to the predictions that hospitals will provide more granular information to physicians, which in turn will be used by physicians to reduce cost. Results using DRG-level data from Washington State hospitals for the period 1986–1988 suggest that physicians need both disaggregate and benchmark information to reduce costs. Whether physicians consistently use such granular information for decision making is a matter of debate. [Lapsley \(1994\)](#) uses institutional theory and case evidence from the National Health System (NHS) in the U.K. and shows that responsibility accounting systems are primarily myth and ceremony to legitimize the activities of the NHS to the government. [King, Lapsley, Mitchell, and Moyes \(1994\)](#) find evidence from four NHS hospitals that granular information systems such as ABC are used for budgeting and performance measurement, but not used as extensively for customer profitability.

Accounting studies have examined the implications of new information generated by DRG-type systems. Using the sociology theory of translation, [Lowe \(1997\)](#) shows that new information provided by costing systems (such as by DRG) enables hospitals and clinics to assign responsibility to clinicians for patient treatment outcomes and costs of treatment. New information allows decision makers to translate and combine disparate elements of the service process. [Evans, Hwang, and Nagarajan \(2001\)](#) report similar findings in their study of the effect of a physician-profiling program that provided DRG-level length of stay (LOS) benchmark data for individual physicians. Although the physician profiling reduced LOS, it did not significantly reduce hospital costs because of an associated increase in procedures per patient day. The effect of the availability of new performance measures is also the topic of interest in [Guven-Uslu and Conrad \(2011\)](#), who examine the MACS effects of comparative reference cost calculations and disclosure in NHS trusts. They focus on the context (why and when), content (what), and process (how) of change. In terms of the content, their results indicate that the new performance measurement system provided accuracy improvements but not resource allocation improvements. In terms of the context, the new performance measurement system changed managerial perceptions, albeit slower than planned. In terms of processes, the new system improved technical communication and power relations, although gaps continued to exist.

[Pizzini \(2006\)](#) adds to the above literature by testing a conceptual model that links cost system design to performance. If refined cost systems produce decision-relevant information, then it should ultimately improve performance. [Pizzini \(2006\)](#) examines four cost system attributes: detail, disaggregation by behavior, reporting frequency, and variance information. Results indicate that managers' evaluation of cost system usefulness is positively associated with cost systems' detail, classification of costs by behavior, and reporting frequently. However, financial performance is only influenced by the ability of the cost system to provide cost detail that allows for efficiency in managing cash flows and administrative expenses. [Aidemark and Funck \(2009\)](#) extend this line of research by examining the effect of a balanced scorecard (BSC) on managerial culture, using a

sociology lens. BSC implementation results in quality improvements by an increase in decentralized decision-making and a focus on problem orientation. BSC measures were also introduced in the context of medical treatments, albeit gradually. Overall, they find that the BSC takes time to gain wide approval. In terms of balanced scorecard information use for contracting, [Petersen \(2007\)](#) finds that while downstream revenue can be used for contracting, it contains noise. For efficiency gains, coordinated changes to organizational structure and MACS are required ([Thibodeau, Evans, Nagarajan, and Whittle 2007](#)). An important element of organizational structure is delegation of authority to physicians. [Abernethy and Vagnoni \(2004\)](#) find that formal delegation of authority to physicians influences their use of accounting information for decision making, which in turn improves physician cost consciousness.

Another topic of research in the context of Link 1 is cost behavior. Hospital data are often available at a level of granularity that allows for a careful calibration of cost functions that is not feasible with other data sources. An early example is [Noreen and Soderstrom \(1994\)](#), who use data from Washington State hospitals to demonstrate that, contrary to the prevalent notion in practice, overhead costs demonstrate increasing returns to scale. A follow-up study ([Noreen and Soderstrom 1997](#)) finds evidence of substantial fixed costs, while [Balakrishnan, Petersen, and Soderstrom \(2004\)](#) show that proportionality of cost change with activity change is influenced by capacity utilization. [Balakrishnan et al. \(2004\)](#) find evidence of sticky costs, i.e., costs increase more when activity increases than the extent to which they decrease when activity decreases. Nonlinearity of costs and activity volume is further compounded in the presence of joint activities ([Maher and Marais 1998](#)). Cost drivers that were identified in the accounting literature in the context of hospital costs are breadth complexity (number of services), depth complexity (intensity of services) ([MacArthur and Stranahan 1998](#)), and system congestion ([Balakrishnan and Soderstrom 2000](#)).

Ownership Type and MACS Design and Outcomes (Links 2 and 3)

Links 2 and 3 relate to the effects of ownership type on design and outcomes of MACS, particularly the design of executive compensation contracts in hospitals. Empirical research in this area supports agency theory predictions that, like FP, NFP also use incentive compensation tied to accounting metrics to promote goal congruence and reduce agency losses. However, the extent and nature of incentive compensation use is different in NFP because the IRS and hospital stakeholders monitor compensation more closely. Part of the reason is that extensive incentive contracting is not permitted in NFP by the IRS ([Forgione 1999](#)). At the same time, regulatory changes have made hospital financial viability more dependent on cost containment and revenue enhancement, creating the need to incentivize managers. [Lambert and Larcker \(1995\)](#) use agency-based logic to predict that after the adoption of the PPS, hospital administrator compensation contracts would include bonuses tied to financial performance. They estimate nonparametric frontier production cost functions and find that both FP and NFP that were inefficient prior to the PPS increased the use of bonus-based compensation contracts. However, FP placed higher bonus weights relative to NFP. Increased monitoring by boards of directors and state regulators is associated with lower incentive compensation. They also find that GH rely more heavily on monitoring instead of bonus-based incentives. Another example of agency-based research in the context of Link 2 is [Ittner, Larcker, and Pizzini \(2007\)](#), who use survey data from individual physicians to investigate the effects of goal congruence, performance measure informativeness, and monitoring ability on the mix of salary and performance-based compensation. The authors find that as the proportion of capitation revenues increases for the group, less weight

is placed on performance-based compensation because it would not align the goals of the group and individual physicians.⁴ As the practice size increases, monitoring becomes more difficult and performance-based compensation is used. Research has also explored the association between hospital governance and quality-of-care outcomes. For example, [Bai and Krishnan \(2015\)](#) find that having physicians on hospital boards is associated with a higher quality of patient care.

District hospitals have a unique ownership structure that includes aspects of both GH and NP. These hospitals are owned by municipal districts and governed by publicly elected boards of directors with public board meetings. District hospitals can levy property taxes to a limited extent and then use these funds for operations. District board members face pressure in public meetings and are at risk of not being reelected. During elections, the most common political platform for board candidates is cost containment. As a result, a primary focus of board meetings is reducing administrative costs because they are not perceived to provide tangible community benefits. CEO compensation is a particularly contentious issue, and direct monitoring is perceived as a substitute for incentive compensation. When district hospital CEOs are paid less than CEOs in comparable privately owned NFP, selection and incentive problems arise and hamper firm performance, especially when the environment becomes more challenging. [Eldenburger and Krishnan \(2003\)](#) find that district hospital CEOs have significantly lower compensation relative to a matched sample of NFP. Operating margins are lower in district hospitals than in the matched sample, especially when operating risk increases.

Because of differences in the pressures exerted by different groups of stakeholders, FP may conform to agency-based predictions, whereas GH behavior may be more consistent with the tenets of institutional theory. Governance structures in FP and NFP encourage incentive contracts that use accounting-based performance measures. Accordingly, accounting information complements incentive contracting in FP and NFP. In contrast, GH rely on tax subsidization and report to other agencies or a county board of supervisors or city council. As government agencies, these hospitals experience constraints on the amount of compensation allowed and the use of performance-based incentives in compensation contracts. As a result, GH are less likely to use higher levels of pay or pay-for-performance contracts to motivate performance. GH managers focus less on financial performance, but more on justifying cost overruns and budget requests to supporting agencies. To maintain legitimacy with stakeholders, they invest in more elaborate accounting systems. Consistent with these theoretical predictions, [Eldenburger and Krishnan \(2008\)](#) find a positive association between the pay-for-performance sensitivity measures and expenditures on accounting information in FP and NFP, but no association in GH. While FP tend to invest in accounting information that helps improve their revenue positions, NFP invest in accounting information that assists in making decisions regarding operating efficiency and cost containment.

In addition to profits, another variable of importance in hospitals is charity care. FP have fewer pressures to provide charity care and can emphasize a single objective, i.e., profits. Therefore, FP managers will reduce their charity care levels in response to higher incentive compensation. In contrast, stakeholders and donor expectations, as well as constraints regarding profit distribution, encourage NFP managers to provide charity care as a service to the community. Charity care also is required to maintain their tax-exempt status. [Eldenburger, Gaertner, and Goodman \(2015\)](#) find a negative relation between charity care and incentive compensation in FP, but no relation in NFP.

Another topic that has been explored within Links 2 and 3 is the effect of organizational structure, delegation, and managerial characteristics on MACS design and use. Organizational

⁴ Capitation is a payment plan in which physicians are paid a set amount for each patient assigned to them, regardless of whether the patient seeks treatment.

structure and design should allow professional autonomy, but formal administrative control systems are required to maintain control. [Abernethy and Stoelwinder \(1995\)](#) find lower role conflict between professional and bureaucratic norms and values in environments with lower levels of output controls. [Abernethy and Stoelwinder \(1990a\)](#) examine differences between physician managers' and senior physicians' goal orientation on the organization. Physician managers' budgeting behaviors reflect their orientation to management-related goals and organization obligations. [Abernethy and Stoelwinder \(1990b\)](#) find lower use of budgeting systems in clinical departments than in support departments. Physician managers use budgeting systems more than senior physicians, who are focused on treating patients. Perceived decision usefulness of MACS information influences supervisors' use of the information ([Mia and Goyal 1991](#)).

A critical negative outcome for hospitals is financial distress and closure, which has disastrous implications not only on the hospital, but also on the local community. Hospitals in financial distress typically have large amounts of uninsured patients, who lose their primary access to care if the hospital closes. Several factors drive hospital distress including size, patient mix, and ownership. Ownership and governance play a direct as well as an indirect role in hospital outcomes. For example, prior studies ([Forgione 1987](#); [Forgione, Schiff, and Crumbley 1996](#)) find that FP are systematically smaller, have a lower case mix, and lower LOS. Thus, structural factors enable FP to have a lower cost per patient, and correspondingly higher profitability. Other structural factors that drive profitability are teaching status, occupancy rates, and location ([Younis, Forgione, Khan, and Barkoulas 2003](#); [Younis and Forgione 2005](#)). Teaching hospitals have high cost structures because of expensive infrastructure, patient complexity, urban location, and greater indigent populations. Further, they have higher revenue risk because their budget allocations are subject to the vagaries of changing political milieus ([Forgione 1987](#); [Forgione et al. 1996](#); [Younis 2006](#)). A comprehensive examination of the drivers of hospital closure by [Liu, Jervis, Younis, and Forgione \(2011\)](#) finds that managerial incentives and political costs are associated with hospital closure. They find that predictors of hospital closure include low occupancy rates, return on investment, asset turnover, urban location, teaching status, high levels of Medicare and Medicaid patients, and high debt. Hospitals that are not affiliated with a multihospital system are also vulnerable to closure.

Market Structure and MACS Design and Outcomes (Links 4 and 5)

While most accounting studies include competition as a control variable, few examine competition as a determinant or moderator of MACS. An early study by [Foster \(1987\)](#) posits that restricting competition to protect NFP could lead to inefficient cost structures and duplication of facilities. [Evans, Hwang, and Nagarajan \(1995\)](#) and [Evans et al. \(2001\)](#) study the effects of competitive benchmarking on hospital costs within the context of physician profiling. Physician profiling produces benchmarks that enable physicians to compare relative performance. [Evans et al. \(1995\)](#) find that profiling increases the likelihood of LOS target achievement by physicians, and this likelihood is more pronounced for poorly performing physicians. [Evans, Kim, and Nagarajan \(2006\)](#) examine another aspect of competition—legal liability. They find that the strength of the association between task uncertainty and legal liability influences the extent of cost risks in physician contracts. Excessive focus on competitive benchmarking can also have adverse effects; for example, [Llewellyn and Northcott \(2005\)](#) show that competitive benchmarking pressures force hospitals to become “average” to comply with the benchmark. Instead of a focus on excellence, being “average” becomes the norm and the subject of its aspirations. Competitive environments also impact hospital-physician contracts. For example, [Evans, Kim, Nagarajan, and Patro \(2010\)](#)

find that external pressures to improve nonfinancial performance such as quality of care increase the use of nonfinancial measures in incentive contracts. [Conrad \(2015\)](#) posits that competition can influence the impact of value-based payment schemes on medical quality as well as cost efficiency.

Evidence indicates that competition can impact hospital investment in MACS. [Krishnan \(2005\)](#) finds that hospitals substantially increased their investments in accounting systems after an increase in financial pressure due to regulatory change. The effects were more pronounced for hospitals located in more competitive markets. Under conditions of competitive risk such as demand variability, hospitals are likely to explore actions that increase the elasticity of their cost structures to maintain agility and prevent losses. [Holzhacker, Krishnan, and Mahlendorf \(2015b\)](#) find that hospitals facing higher demand volatility increase the flexibility of their cost structures to protect themselves from the downside risk of financial default. Three distinct actions that hospitals use to influence cost elasticity include outsourcing, leasing versus purchasing of equipment, and flexible work arrangements. Consolidation is another strategy explored by hospitals to deal with competition. Hospitals have engaged in significant M&A activity since the 1990s to gain negotiating parity with merging insurance companies, merging physician organizations, and merging employer health benefit consortia ([Krishnan et al. 2004](#)). Publicly available data such as the Office of Statewide Health Planning and Development (OSHPD) and American Hospital Association (AHA) databases allow researchers to construct reliable measures of competition and explore the mechanisms through which competition influences cost functions with a level of granularity and nuance.

Regulation and MACS Design and Outcomes (Links 6 and 7)

MACS design, mechanisms, and processes that enable organizations to respond and adapt to changes in their operating environment have been a topic of interest to accounting researchers for decades ([Abernethy and Brownell 1999](#)). Correspondingly, a large body of research in accounting has explored the effects of regulation on MACS, including numerous articles that examine how the PPS influenced hospital MACS, some of which are summarized in Appendix A. This section highlights some insights from this research.

The PPS was first used for inpatients. Thus, Medicare inpatients were reimbursed based on a fixed fee, whereas outpatients continued to be reimbursed based on cost. [Eldenburger and Kallapur \(1997\)](#) examine whether hospitals changed their cost allocations to shift costs from inpatients to outpatients to maximize reimbursements. Medicare required a step-down cost allocation method; however, hospitals had discretion in choosing among specified cost allocation bases. They find that after the PPS, hospitals allocated significantly greater proportions of overhead costs to Medicare outpatients relative to inpatients, even after controlling for volume, thereby maximizing hospital revenue. Hospitals could also strategically alter their budgets to maximize revenues under a state mandated rate-setting regulation that capped revenues. [Eldenburger and Soderstrom \(1996\)](#) find that hospitals systematically overestimated budgeted contractual adjustments (the difference between gross charges and reimbursement), which are deductions from revenue. In addition, they biased budgeted patient volumes and variable costs systematically. This behavior allowed them to relax the revenue constraints. Cross subsidization, whereby hospitals systematically charged higher prices to selected patient groups and ailments to cover the uncovered cost of treating uninsured or underinsured patients, was not only common ([Dranove 1988](#); [Gruber 1994](#)) but also implicitly approved by regulators to help hospitals defray the costs of providing access ([Covaleski, Dirsmith, and Michelman 1993](#)).

Cost shifting requires that hospitals invest in cost accounting systems that provide granular information to facilitate such shifting decisions. Furthermore, hospitals also require more

disaggregated cost accounting systems to facilitate efficiency-enhancing decisions. Evidence suggests that hospitals increased their investments in accounting systems after the PPS. [Rezaee \(1993\)](#) finds that hospitals increased the cost accounting sophistication for performance evaluation and variance analysis. [Kallapur and Eldenburg \(2005\)](#) examine changes in the structure of total cost within a real options framework. Real options theory suggests that uncertainty leads firms to prefer technologies with low fixed and high variable costs. When reimbursement regulation changes from cost-plus to fixed price, revenues became a function of volume rather than cost. In response to this increase in uncertainty, hospital managers increased the proportion of variable costs relative to fixed costs in their cost functions. Thus, when regulatory changes adversely affect revenue functions, hospitals make decisions that alter the composition of costs.

Outsourcing is one of the mechanisms that hospitals use to influence the elasticity of cost functions. [Balakrishnan et al. \(2010\)](#) use TCE to examine the effect of changes in cost pressures on hospital outsourcing. During cost-plus regulation, all hospital services that were kept in-house were profitable. Therefore, the transaction costs of outsourcing were greater than the transaction costs of keeping services in-house. However, cost pressures imposed by the PPS and the managed care environment encourage cost reduction through outsourcing. Therefore, the transaction costs of contracting with external vendors would be lower than the cost of keeping the service in-house, leading to increased outsourcing in response to cost pressures. Results indicate greater outsourcing of nonclinical services after the PPS.

Although the PPS was implemented in 1983, the earlier provisions excluded capital expenses such as depreciation and interest expenses, which continued to be reimbursed on a retrospective cost basis. The PPS for capital expenses (i.e., CPPS) was implemented over a ten-year period from 1991. [Barniv, Danvers, and Healy \(2000\)](#) examine the effect of CPPS on cost efficiency and capital expenditures. Their analysis of 2,048 hospitals reveals a significant decline in capital expenditures and an increase in profitability following CPPS implementation. However, operating expenditures such as supplies and salaries remained unchanged. They also find that hospitals substitute operating leases and rentals for capital expenditures, which has the effect of reducing capital expenditures, but adversely affects operating costs. Their results suggest that regulatory changes stimulate hospital managers to trade-off one type of costs for another and thereby affect hospital capital budgets as well as operating budgets.

Accounting research has examined the effects of changes in regulation on cost behavior using data from other countries that had similar regulatory changes. [Holzhacker, Krishnan, and Mahlendorf \(2015a\)](#) use data from the German hospital industry, which changed from cost-plus to a fixed-fee system in 2003. They find that hospitals increase cost elasticity and reduce cost asymmetry in response to the fixed-fee regulation. They also find that ownership influences the level of response, with NFP and GH exhibiting a weaker response than FP. H. Chang, W. Chang, Das, and Li (2004) explore the effect of universal health coverage on operating efficiencies in Taiwanese hospitals. Data Envelopment Analysis (DEA) finds evidence of deterioration in hospital efficiency following the implementation of universal health coverage. [Ernst and Szczesny \(2008\)](#) examine the effects of a change in regulation from cost-plus to capped budgets on treatment of high-risk patients in German hospitals. Analysis of patient-level data reveals a decrease in high-risk patients subsequent to the regulatory change.

While most of this research examines how hospitals *respond* to regulation, there is a paucity of research about how hospitals lobby regulators to *influence* regulation. An exception is [Forgione and Giroux \(1989\)](#), who examine comment letters received by the Healthcare Financial Management Association (HFMA) and find that hospitals take positions on regulatory accounting,

which is consistent with hospitals' economic well-being. Future research is warranted on how hospitals lobby to influence regulatory changes.

Institutional Forces and MACS (Links 8 and 9)

Sociology, especially institutional theory, posits that regulatory and competitive pressures could influence hospitals differentially depending on ownership type and associated institutional structure and constraints. Accounting research has applied institutional theory in the study of hospital MACS with an emphasis on differences arising from hospital ownership. [Covaleski et al. \(1993\)](#) study the DRG framework and suggest that while the purpose of the reimbursement system was to assist hospitals in cutting costs and facilitate implementation of the PPS, the resulting case-mix-level accounting had its roots in institutional conformance and isomorphism. The DRG system's primary role was ritualistic and ceremonial, and created a procedural order that denoted conformity to institutional rules and expectations. [Covaleski et al. \(1993\)](#) do not explicitly study ownership, but their conclusions suggest that some types of institutional forces are common to all types of hospitals. [Abernethy and Chua \(1996\)](#) perform a longitudinal field study of a government teaching hospital in Australia and find that accounting and control systems are not used extensively for planning and control, but rather to rationalize other aspects of the control system such as board structure and budgeting systems.

[Balakrishnan et al. \(2010\)](#) study differences in outsourcing behavior based on differences in institutional constraints based on ownership. FP are less constrained in their ability to outsource, whereas GH face community pressures to limit layoffs, have lower prevalence of managerial incentives, and have soft-budget constraints, which limit their opportunities as well as incentives to outsource. Results indicate systematic differences in outsourcing decisions by hospitals. Relative to GH, FP have a stronger response to cost pressures, and increase their outsourcing of both clinical and nonclinical services. [Holzhacker et al. \(2015a\)](#) use institutional theory and posit that regulatory changes and the associated higher financial risk will spur all types of hospitals to increase their cost elasticity. However, FP will have greater flexibility to change their cost structures relative to NFP and GH. Data from German hospitals reveal that, relative to NFP and GH, FP respond more strongly to changes in regulation when changing their cost elasticity. [Kelly, Doyle, and O'Donohoe \(2015\)](#) combine new public management (NPM) and new institutional sociology (NIS) theories to examine the evolution of new performance management practices. Future research could use their framework to obtain a richer understanding of the drivers of actual practices and mechanisms of hospital performance management.

ADVANTAGES OF USING HEALTHCARE DATA FOR MANAGERIAL ACCOUNTING RESEARCH

The healthcare sector offers publicly available data with a rich granularity that facilitates the testing of management accounting theories. For example, data from California hospitals include cost report information, nonfinancial measures, and patient discharge information and have frequently been used to study a variety of accounting issues including compensation, outsourcing, governance, and the effects of factors such as ownership and competition on investments in accounting systems ([Balakrishnan et al. 2010](#); [Duggan 2000](#); [Eldenburger and Krishnan 2003, 2008](#); [Holzhacker et al. 2015b](#); [Krishnan 2005](#)). Data from Washington State hospitals include budgeted and actual information and have been used to study cost structure, cost behaviors ([Noreen and Soderstrom 1994, 1997](#); [Kallapur and Eldenburger 2005](#)), and the effects of regulation on management behavior

such as cost shifting (Blanchard, Chow, and Noreen 1986; Eldenburg and Soderstrom 1996; Eldenburg and Kallapur 1997). Other data sources include the healthcare databases held by the states of Maryland, Florida, and Texas, and the Center for Medicare and Medicaid services (CMS). National databases available for a fee can be found in the private sector with the American Hospital Association (AHA) and Medical Group Management Association (MGMA). The National Association of Health Data Organizations (NAHDO) offers data to prospective researchers. Table 2 provides a summary of the four most comprehensive healthcare data sources, information contained in the data sources, and examples of potential accounting topics.

There are several advantages of using healthcare data to test management accounting theories. First, hospital production technologies for diagnostic, surgical, and ancillary procedures are similar across individual organizations. The production function is labor intensive, and physicians and other medical staff in different hospitals perform similar procedures and follow similar protocols. Characteristics that cause differences across firms, such as size, investments, patient mix, and illness severity, can be controlled, and as a result it is easier to identify differences that arise from ownership, governance, or changes in managers' behavior. Second, the use of a single industry helps control for regulatory, legal, and competitive factors. Third, archival data can be supplemented with field interviews because many universities have medical schools and researchers can obtain access to medical professionals. Professional organizations such as the Healthcare Financial Management Association (HFMA) offer conferences and networking opportunities so that researchers can develop personal relationships with hospital accounting managers. Fourth, the healthcare industry structure offers some unusual opportunities, such as periodic regulatory changes. The hospital industry in much of the world, including the European Union, India, Taiwan, and the U.S., has undergone changes in regulation and competition beginning in the mid-1980s. Such regulatory and business environment changes provide natural experiments that allow researchers to test hypotheses. For example, several studies discussed above analyze changes in hospital behavior after Medicare's implementation of the PPS (Lambert and Larcker 1995; Eldenburg and Kallapur 1997, 2005; Krishnan 2005). Fifth, the healthcare industry includes organizations with a variety of ownership types. For example, the U.S. hospital industry consists of 51 percent nonprofit, 19 percent for-profit, and 30 percent government (includes state, federal, long-term care, and psychiatric) organizations (source: American Hospital Association: *Hospital Statistics 2018*).⁵ Objective functions and behaviors vary among these ownership types (Dranove 1988; Hoerger 1991; Pauly and Redisch 1973), and these ownership differences, combined with regulatory changes, provide a rich setting to examine a variety of management accounting questions. The relationships among insurers, hospitals, physicians, patients, and other stakeholders such as donors or government agencies are often complicated and characterized by myriad explicit and implicit expectations and contracts that can be studied. Finally, the healthcare sector is a large part of any country's economy. In 2014, the U.S. spent an estimated \$3 trillion on healthcare, or \$9,523 per person, and accounted for 17.5 percent of the GDP. The government estimates that healthcare spending will account for about 20 percent of the U.S. economy by 2024.⁶ Japan's healthcare spending was 10.2 percent of GDP in 2013.⁷ In India, healthcare is a US\$96.3 billion industry, and is expected to reach over US\$195.7 billion by 2018.⁸ China is expected to

⁵ See, https://www.aha.org/system/files/2018-01/101207fastfacts%20with%20picture%202018_0.pdf

⁶ See, <http://money.cnn.com/2015/07/28/news/economy/health-care-spending/>

⁷ See, <https://www.oecd.org/els/health-systems/Country-Note-JAPAN-OECD-Health-Statistics-2015.pdf>

⁸ See, <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Life-Sciences-Health-Care/gx-lshc-2015-health-care-outlook-india.pdf>

TABLE 2

Hospital Data Sources

Source	URL	Description	Examples of Potential Research Projects
Agency for Health Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) Database	https://www.ahrq.gov/	Stratified sample of inpatient data from a national sample of 1,000 hospitals. Data include cost of care, patient and hospital characteristics, quality, and medical outcomes.	<ul style="list-style-type: none"> • Effects of congestion on departmental costs and medical outcomes. • Medical care coordination and hospital costs. • Calibration of medical risks and effect of risk on outcomes and costs. • Association between electronic health records (EHR) and MACS. • Implementation of quality measures into work processes and EHR. • MACS and variations in hospital mortality. • Factors driving hospital readmissions. • Relative cost of Medicare patient treatment in federally funded health centers versus other care settings.
Centers for Medicaid and Medicare Services (CMS)	https://www.cms.gov/	Inpatient data from all hospitals that treat Medicare patients. Variables include diagnoses, procedures, medical outcomes, patient demographics, and coverage.	<ul style="list-style-type: none"> • Cost drivers for various types of patients and insurance plans. • Cost-benefit analysis of capitation versus other forms of payment. • MACS and physician resource use patterns. • Best practices benchmarking and impact on outcomes. • Cost feedback and learning curves. • Association between financial and nonfinancial measures. • Disease management systems and impact on MACS. • Impact of hospital quality initiative on cost and quality. • Efficiency of physician groups versus other physicians.

(continued on next page)

TABLE 2 (continued)

Source	URL	Description	Examples of Potential Research Projects
California's Office of Statewide Health Planning and Development (OSHDP)	https://www.oshpd.ca.gov/	Facility-level data from more than 6,000 hospitals and healthcare facilities. Financial, utilization, patient, services. Inpatient demographics, utilization data. Quality data.	<ul style="list-style-type: none"> • Drivers of readmission in different types of facilities by ownership. • Drivers and consequences of medical errors. • Role of MACS in preventing hospital-acquired illnesses. • Cost behavior for persons infected with HIV. • End-stage renal disease cost management. • Collaborative contracting between hospitals and clinics. • Design of MACS in hospital systems versus standalone hospitals.
AHA Annual Survey Database	http://www.aha.org/	Hospital-specific data on all U.S. hospitals. Organizational structure, personnel, hospital facilities and services, and financial performance.	<ul style="list-style-type: none"> • Longitudinal trends in hospital costs. • Shifts in hospital cost functions as a function of market characteristics. • Impact of M&A on hospital costs and revenue functions. • Hospital product mix changes and impact on cost functions. • Demographic shifts and impact on hospital cost functions. • Cost of treating mental health.

spend \$1 trillion on healthcare by 2020.⁹ These substantial numbers demonstrate the economic significance of healthcare, and the policy implications of research in this area.

CURRENT DEVELOPMENTS IN HEALTHCARE IN THE WORLD

Our discussion so far has focused considerably on the U.S. hospital industry; however, throughout the world, there have been regulatory and other changes that parallel the U.S. hospital industry. With an aim of reducing overall healthcare cost and improving the quality of health of the population, several countries have recently begun to pay hospitals and physicians' bonuses for meeting targets for specific types of preventative care practices. For example, beginning in 2003, the U.K. implemented a bonus system for physicians entitled "Quality and Outcomes Framework." Physicians can receive bonuses amounting to 25 percent of their salaries by meeting government targets for the percentage of patients receiving specific types of preventative care. A practical example is a contract in which a portion of a physician's bonus is based on the percentage of coronary heart disease patients with total cholesterol levels less than the 190 mg/dl cholesterol level (Roland 2004). As part of this program, the U.K. provided funds for physicians to purchase and use specific software for electronic medical records. Substantial data are available to study the effects of these bonuses on behavior and to estimate cost savings from their implementation. These changes influence MACS. For example, when a bonus is based on preventative care goals, it encourages physicians to exert effort on preventative care; however, it may reduce patient volume and reduce occupancy rates. This can negatively influence hospital operating performance because some fixed costs may not be amortized. Thus, there is a tension between the public policy goals of improved preventative care and reduction in total healthcare cost, and reduced occupancy rates for the individual hospital.

After the enactment of the ACA in 2014, significant changes are occurring in the U.S. healthcare system with implications for hospital production, revenue, and cost functions. In the arena of hospital production functions, the ACA has discontinued payment for treatment related to hospital errors. These errors are labeled "never events" by Medicare and include errors such as surgery on the wrong body part or mismatched blood transfusions. In 1999, the Institute of Medicine (IOM) estimated that as many as 98,000 deaths a year were attributable to medical errors. Another study reviewed 18 types of medical events and concluded that medical errors may account for 2.4 million extra hospital days. This resulted in \$9.3 billion in excess charges (for all payors), and 32,600 deaths.¹⁰ There has not been any significant improvement since then, as revealed in the IOM's most recent report.¹¹ Another important issue is that it is difficult to reach consensus on how to measure quality of care. Although the data on mortality attributed to medical errors or prescriptions drugs are available on an international basis, there is wide variation in data quality. For instance, cardiothoracic surgeons in the U.S. accept responsibility for patient mortality up to 30 days after surgery, whereas cardiologists accept such responsibility only until the patient leaves the operating room. To counter this trend, hospitals have been providing incentives for quality improvements. Anonymous hotlines have been installed for reporting medication errors and other problems. Emphasis on healthcare quality is increasing with the advancements in

⁹ See, <https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/health-care-in-china-entering-uncharted-waters>

¹⁰ See, <https://www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-sheets/2006-Fact-sheets-items/2006-05-18.html>

¹¹ See, <https://www.usnews.com/news/articles/2015/09/22/iom-study-shows-errors-in-diagnosis-harm-countless-patients-each-year>

information technology, particularly IoT (Internet of Things). Social media data can be exploited to examine a variety of accounting topics such as quality disclosures and outcomes. In recent years, the quality of the databases (CMS) has improved, providing greater opportunities for researchers to pursue impactful research. The European database on quality-adjusted life years (QALYs) has become more comprehensive in recent years, offering potential for meaningful research. Researchers could analyze the specific quality measures used in performance-based contracts between hospitals and physicians and managers and their effects on error reduction and hospital costs. There is also a paucity of research in accounting that explores group-based nonfinancial incentive schemes in mixed professional groups.

Since 2010, Medicare has introduced value-based purchasing (VBP) as a performance assessment model to score hospitals on a series of quality measures for the process of care, patient experience, outcomes, efficiency, and care coordination. Medicare has introduced financial premiums and penalties for hospitals based on treatment procedures and quality indicators. These tournament-based schemes have the potential to improve overall performance, while at the same time they can cause unhealthy competition or collusion among the hospitals. Effects of programs such as VBP can be studied using economic theories of tournaments (Lazear and Rosen 1981).

In 2012, Medicare began to reimburse hospitals based on VBP. Currently, about 30 percent of fee-for-service payments have become value-based. Reimbursement is based on four specific categories (clinical care, patient experience of care, safety, and efficiency), each of which has one or more performance measures. As examples, the current clinical care outcome measure is the hospital mortality rate and the efficiency measure is Medicare spending per beneficiary.¹² Accordingly, managers will need to balance investments in quality with cost reduction efforts. This new reimbursement system will affect hospital budgets and the budgeting process because clinical managers will need to understand the correlations among the performance measures and need a different set of information and targets. In addition, compensation contracts for clinical managers have begun to weight both financial and nonfinancial measures.

Other changes for home health providers include provisions for pooling of the estimated savings from reduced use of emergency rooms, fewer hospital episodes, and less need for nursing homes. Payments from these savings pools are used to incentivize quality improvements and more savings. Contracting between hospitals and home health providers is becoming more complex and relying more heavily on specific nonfinancial performance measures. In addition, potentially collaborative contracts will arise that can be studied using a transaction cost economics framework.

The ACA has changed payment systems and introduced bundled payments for the total cycle of care for patient episodes. Previously, separate payments were made to the hospital, treating physician, and any diagnostic labs for patient treatment around a hospital episode. Under the ACA, bundled payments are made to the hospital for treatment of a patient before and after the episode. The level of reimbursement for the bundle is explicitly linked to treatment quality and value of care. Effective decisions about splitting the bundled payment among different legal entities and attaching incentives to bundled outcomes require sophisticated contracting and provide potential for analytical as well as archival research. The ACA is likely to have profound implications for costs and reimbursements. These implications are likely to vary across hospitals by ownership types. A recent survey reveals that the uninsured rate has dropped from 16 percent in 2010 to 8.9 percent

¹² For more information, see https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/Hospital_VBPPurchasing_Fact_Sheet_ICN907664.pdf

in 2016 after the enactment of the ACA.¹³ Expectations of accessibility and affordability and continued coverage for all insured will be at the center of any new health policy, and accounting research can examine the cost-benefit trade-offs of access and medical cost.

In 2004, Taiwan changed from a flat fee per patient reimbursement scheme to a global budget for hospital treatment. Under the global budget, the total hospital budget for the country is divided among hospitals according to their proportion of treatment for total patients treated. Cheng, Chen, and Chang (2009) find that hospitals protected their financial interests by increasing per-case expense claims under the global budget cap, but did not increase preventative services, which was one of the policy aims. Further, the reimbursements for expenditures on drugs were not completely covered by the global budget system (GBS). Consequently, evidence indicates that hospitals shifted costs to prescription drugs, and therefore the GBS increased overall expenditures on drugs (Zhang, Chou, Deily, and Lien 2014). Researchers can examine hospital behaviors after the change in price regulation. While some of the same outcomes that were found in the U.S. (such as cost shifting and product mix changes) may be found in Taiwan, some differences may also occur because of the differences between the Taiwanese and U.S. healthcare sectors (such as single payor, public insurance systems in Taiwan as opposed to a significant presence of private insurers in the U.S., etc.). Of course, in cross-country comparisons of healthcare systems, adjustments need to be made to control for country-specific factors including international case-mix adjustments (e.g., Forgione, Vermeer, Surysekar, Wrieden, and Plante 2005). For example, Forgione and Vermeer (2002) use the Organization for Economic Cooperation and Development's (OECD) healthcare database to build an international case-mix index that can be utilized for cross-country healthcare studies.

While a research stream that compares behavior across ownership types is well established for U.S. hospitals, little research has analyzed these differences within single payor systems. Taiwan moved toward a single payor system about 20 years ago.¹⁴ Some research on hospital efficiency by ownership type has been conducted using Taiwan healthcare data (Chang et al. 2004). Other aspects of hospital behavior, such as whether and how incentive contracts and bonuses are used, could be investigated to shed new light on such practices within a different regulatory regime. Similarly, differences in incentives within an agency theory framework could be investigated and compared between single and multiple payor systems. In the U.S., there is cross-sectional variation in the types of incentive contracts that are used within hospitals and physician practice groups based on ownership and other characteristics. Research has addressed factors that determine the types of contracts used (Evans et al. 2006). There is a need for research analyzing changes in the intensity and forms of contracts in response to regulatory changes, such as the implementation of bonuses or penalties for treatment practices, quality outcomes, and bundled payments under the ACA.

Within each ownership type, there are variations in the contracting arrangements between hospitals and physicians. For example, some HMOs (such as Kaiser Permanente) employ physicians directly, own diagnostic testing centers, and provide nearly every aspect of patient care. Little research has examined the effects of these contracting and organizational differences on the use of accounting systems for monitoring versus contracting. While most of these integrated systems such as Kaiser Permanente do not provide data for public use, researchers could explore employing field or survey techniques to obtain data for testing hypotheses.

¹³ See, https://www.cdc.gov/nchs/data/nhis/earlyrelease/earlyrelease201611_01.pdf

¹⁴ See, <https://www.brookings.edu/opinions/taiwans-health-care-system-the-next-20-years/>

CONCLUSIONS

This paper reviews existing literature and identifies several opportunities for research in management accounting and control in the hospital industry. The first opportunity for researchers deals with changes in regulation and competition and their implications for contemporary managerial accounting questions. The competitive positioning strategies of the three major hospital ownership forms—FP, NFP, and GH—against changing regulations will continue to be of interest to managerial accountants. Accounting literature integrated with strategy literature offer researchers an opportunity to perform more nuanced studies of cost behavior and competitive pricing and strategic and financial performance in the regulated hospital industry. Although pricing for hospital services is highly regulated, there are some ailments for which competitive pricing continues to prevail. To generate higher return, hospitals continuously scan the environment to capitalize on such opportunities (Conrad 1984).

Second, accounting research has tested hypotheses derived from agency theory, transaction cost economics, and institutional theory. Future research can explore testing of hypotheses using resource dependency theory (RDT). RDT is particularly useful to examine hospital MACS because hospitals operate in a competitive landscape against the backdrop of uncertainty, complexity, and dynamism in the external environment. In the 40 years since Pfeffer and Salancik's (1978) seminal work, RDT has been applied in various business disciplines to explain how organizations navigate the complexities of the environment (Hillman, Withers, and Collins 2009). However, it has been underutilized in accounting except for a few studies such as Vermeer et al. (2006, 2009a, 2009b). Pfeffer and Salancik (1978) have offered five possible options for firms to minimize environmental dependencies. These include mergers/vertical integration, joint ventures, boards of directors, political action, and executive succession. RDT combined with agency, TCE, or institutional theories can shed light on the complexities of hospital behavior. For example, the integration of RDT with TCE will provide a broader perspective for studying economic efficiency. Relationship contracting, trust building with the board of directors and managers, collaboration in the executive team and with key constituencies, and vertical integration based on trust and quality can help hospitals to cope more effectively with the environment and create a competitive advantage, even amid agency problems. Integration of RDT with institutional theory to explain hospital behavior and provide accounting solutions also holds promise. Both theories advocate trade-offs among multiple objectives given the constraints of the external environment and internal organizational structures. Establishing an atmosphere of collaboration and trust among competing groups in the external and internal environments is likely to yield goal alignment. These are questions of interest to scholars and practitioners alike. The tools to help navigate the external environment, establish greater collaboration and trust among all constituencies, and design new performance measurement systems can be found in the rapidly growing information technology sector.

Third, future research can explore the role of the balanced scorecard and other balanced measurement systems to gauge the impact of state spending rates on health and other social services. Research reveals that states with a higher ratio of social to health spending (operationalized as the sum of social service spending and public health spending divided by the sum of Medicare spending and Medicaid spending) generated better subsequent health outcomes for a number of ailments (Bradley et al. 2016).

Finally, future studies can compare and contrast the U.S. and other developed economies in the measurement and operationalization of cost, revenue, and health outcome variables. Recent trends such as more efficient and timely cost sharing in private health insurance plans and Medicare payment plans, integration of technology, and information sharing among physicians and

hospitals offer opportunities to generate standardized cost and quality measures. The balanced scorecard has been successfully used in the EU to modernize hospital accounting systems (Aidemark and Funck 2009). Overall, research in the hospital industry has rich potential for accounting researchers to provide a deeper understanding of the complexities and dynamics of design and outcomes of MACS, especially in nonprofit and government organizations.

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APPENDIX A

Summary of Management Accounting Research in the Hospital Industry
Panel A: Link 1: Management Accounting System Design and Management Accounting Outcomes

Author, Year, Journal	Other Links	Theory	Hospital Control	Key Findings	Dependent Variable(s)	Independent Variable(s)	Time Period of Data	Data and Source
Eldenburg (1994), TAR	3, 6	Econ	NFP	Physicians incorporate new cost information to facilitate efficient resource allocation.	Average charges	Information disclosure frequency	1986–1988	87 hospitals, Washington State
King et al. (1994), FAM		Econ	NFP	ABC is useful for cost reduction and budget preparation, but less useful for product costing.	Case study	Case study	Not provided	4 NHS hospitals in England
Noreen and Soderstrom (1994), JAE		Econ	NFP	Overhead costs are not strictly proportional to activity.	Overhead cost	Service units (activity volume)	Actual 1987, Budget 1990	100 hospitals, Washington State
Abernethy (1996), FAM	3	Mgt	GH	Match between individuals' managerial orientation and the use of budget positively impacts subunit performance. SOPs and social controls positively impact performance.	Subunit performance	Managerial orientation, use of budget, SOP, and social control	Not provided	55 physician managers of Australian hospitals
Balakrishnan, Grucica, and Nath (1996) CAR		Econ	NFP	Complexity of care drives operating costs. Cross sectional departmental variations are present.	Operating cost	Volume, complexity	1986	154 Ontario hospitals
Lowe (1997), MAR	6	Soc	NFP	DRG and case-mix-based information systems influence decision makers by facilitating the translation and inscription of data.	Case study	Case study	1994	New Zealand hospital
Noreen and Soderstrom (1997), RAST		Econ	NFP	Substantial overhead costs are fixed. ABC systems likely overstate incremental costs. Overhead costs display stickiness.	Overhead cost	Service units (activity volume)	1997–1992	108 hospitals, Washington State
Maher and Marais (1998), JAR		Econ	NFP	Linear ABC does not account for joint and indivisible services.	Resource savings	Service volume	Not Provided	49 outpatient surgeries
MacArthur and Stranahan (1998), JMAR	3, 5, 6	Econ	NFP, FP, GH	Hospital breadth and depth complexity are simultaneously drivers of overhead costs.	Overhead cost, service in-volume, service intensity	Location, ownership, litigation, regulation	1988–1989	5,352 U.S. hospitals, Health Care Financing Administration
Balakrishnan and Soderstrom (2000), JMAR	3, 5	Econ	NFP	System congestion increases cost of providing service. Financial incentives and medical risk influence the relation.	Cesarean section rates	Congestion based on occupancy rate	1992–1995	225,473 maternity admissions, 30 hospitals, Washington State
Evans et al. (2001), JAPP	5	Econ	NFP	Management accounting and control techniques, and physician profiling was successful in reducing length of stay but less successful in reducing cost.	Cost, length of stay, procedures	Information system, hospital controls	Monthly data from 1990–1993	HCUP hospital data

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APPENDIX A (continued)

Author, Year, Journal	Other Links	Theory	Hospital Control	Key Findings	Dependent Variable(s)	Independent Variable(s)	Time Period of Data	Data and Source
Aptel and Pourjalali (2001), <i>IJA</i>		SCM	NFP, FP	There are differences in logistics operations between U.S. and French hospitals in terms of (1) level of collaboration with suppliers and (2) level of maturity of logistics programs.	Maturity of logistics and collaboration among departments	Hospital type (U.S., French)	1994–1997	75 survey responses from U.S. hospitals and 126 from French hospitals
Balakrishnan et al. (2004), <i>JAAF</i>		Econ	FP	Magnitude of activity change and capacity utilization influences cost stickiness.	Change in activity, change in cost	Magnitude of activity change, capacity utilization	1994–1997	One firm with 49 therapy clinics
Abernethy and Vagnoni (2004), <i>AOS</i>	4	Mgt	GH	Formal delegation of authority to physicians has direct impact on use of accounting information for decision control. Informal authority influences physician cost consciousness.	Cost consciousness, decision control and management	Formal authority, information characteristics	NA	Survey of 56 Italian teaching hospitals
Bouillon, Ferrer, Stuebs, and West (2006), <i>JAPP</i>		Econ, Str	NA	Managers' acceptance of organizational strategy and consensus thereof has economic benefits for resource use, volume, efficiency, and cost structure flexibility.	Inputs, volume, efficiency, cost structure flexibility	Strategy acceptance	1997–1998	979 surveys from hospitals, AHA
Pizzini (2006), <i>AOS</i>	3	Econ	NFP, FP, GH	Cost systems that provide greater cost detail and have higher functionality provide better data for decision making and improve hospital efficiency.	Managers' perceptions of cost system relevance, and decision use	Detail, classification ability, frequency, number, type of variances	1997–1998	Survey data from 277 hospitals
Thibodeau et al. (2007), <i>TAR</i>	3	Econ	GH	Coordinated changes in organizational structure and management control systems increased efficiency.	Cost per patient	Reorganization dummy, case mix, governance	1992–1998	VA internal accounting systems
Petersen (2007), <i>CAR</i>		Econ		Clinics generate downstream revenue that can be included in performance measurement. However, horizon and noise hamper their use in contracting.	Bundled revenue and downstream revenue	Distance, time, type of clinic, performance measure characteristics	1992–1998	Patient data from 12 clinics
Balakrishnan and Gruca (2008), <i>CAR</i>		Econ, Str	GH	Operating costs are sticky at the hospital level. Core competency influences stickiness.	Change in operating cost	Change in activity, decrease, core competency	1986–1989	189 Ontario hospitals
Aidemark and Funck (2009), <i>FAM</i>		Soc	GH	Use of balanced scorecard measures lead to a change in culture. Hospital managers used the balanced scorecard for healthcare and management processes.	Use of balanced scorecard	Drivers of use of balanced scorecard	2000–2005	Three Swedish county hospitals
Eldenburg, Soderstrom, Willis, and Wu (2010), <i>AOS</i>		Econ	GH	Changes in treatment patterns in response to an ABC implementation that included physician input.	Patient charges	Pre- and post-ABC	2000–2001	Ophthalmology patient data from a large government hospital in Taiwan

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APPENDIX A (continued)

Author, Year, Journal	Other Links	Theory	Hospital Control	Key Findings	Dependent Variable(s)	Independent Variable(s)	Time Period of Data	Data and Source
Eldenburg, Gunny, Hee, and Soderstrom (2011), TAR	3	Econ	NFP	NFP managers engage in real activity management to meet earnings benchmarks using both expenditure manipulation and asset management techniques. Some evidence that new NHS performance measures provided more accurate data for planning, pricing, contracting, and communication among clinicians, managers, and accountants.	Change in nonoperating activity; pay for performance sensitivity, real earnings management	Benchmark	1998–2003	California hospitals
Guyen-Uslu and Conrad (2011), FAM	3	Soc	GH		Case study	Case study	2000–2006	Three U.K. NHS hospital trusts

Panel B: Link 2: Governance and Control and Management Accounting System Design

Author, Year, Journal	Other Links	Theory	Hospital Control	Key Findings	Dependent Variable(s)	Independent Variable(s)	Time Period of Data	Data and Source
Abernethy and Stoelwinder (1990a), FAM	1	Soc	GH	Physician managers (1) identify with management-related goals and (2) use budgeting systems for planning, evaluating, monitoring, and managing subunit activities to a greater extent than other physicians.	Bureaucratic orientation, budgeting behavior	Physician managers versus senior physicians	Not provided	Survey responses from 20 senior physicians and 17 physician managers
Mia and Goyal (1991), FAM	1	Mgt	GH	Supervisors' perceived task interdependence influences relationship between span of control and perceived usefulness of MAS information for decision making.	MAS information characteristics	Supervisor characteristics	Not provided	49 subunit supervisors and managers in 21 New Zealand hospitals
Lambert and Larcker (1995), JAPP	3, 5, 6	Econ	NFP, FP	Hospitals that were inefficient prior to regulatory change had higher likelihood of managerial contracts with larger bonuses after the regulatory change.	Size of bonus relative to salary	Hospital inefficiency based on nonparametric production frontier	1986	Survey of 1,078 hospitals
Abernethy and Lillis (2001), JMAR	3	Str	GH	Organizational structure mediates the relationship between strategic priority given to service innovation and performance measurement systems. Strategic choice influences top management's decisions to grant autonomy to lower-level managers.	Efficiency and effectiveness	Service innovation, structural autonomy, clinical performance, resource management performance	Not provided	56 Australian hospitals
Leone (2002), JMAR	4	Econ	NFP, FP	Organizational form and customer mix create agency costs and are associated with different types of HMO-Physician contracts	Likelihood of fee-for-service contract	Type of organizational form, competition, product mix	1994	540 HMOs from InterStudy

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APPENDIX A (continued)

Author, Year, Journal	Other Links	Theory	Hospital Control	Key Findings	Dependent Variable(s)	Independent Variable(s)	Time Period of Data	Data and Source
Aidemark and Lindkvist (2004), <i>MAR</i>	1	Mgt	FP, GH	Privatization of hospitals increases production, financial performance, and decision speed.	Case study	Case study	2001	2 Swedish hospitals
Naranjo-Gil and Hartmann (2006), <i>JMAR</i>		Str	GH	Top management team (TMT) background influences use of the management accounting system (MAS). TMTs with more professional (administrative) orientation make more interactive (diagnostic) use of MAS and nonfinancial (financial) information.	Path model of professional TMT, MAS characteristics, strategy implementation	Path model	Not provided	473 Survey responses from Spanish hospitals
Naranjo-Gil and Hartmann (2007), <i>AOS</i>		Str	GH	Use of MAS partially mediates the relationship between TMT heterogeneity and strategic change.	Structural model of strategic change, TMT heterogeneity, broad MAS scope, interactive use of MAS	Structural model	Not provided	381 survey responses from Spanish hospitals
Ballantine, Forker, and Greenwood (2008), <i>FAM</i>	1	Econ	GH	Compensation committees do not appear to link pay to performance. There is a positive association between poor hospital performance and CEO turnover.	Turnover, CEO compensation, change in CEO compensation	Change in performance, size, compensation committee	1998–2005	British hospital trusts
Eldenburg et al. (2015), <i>CAR</i>		Econ	NFP, FP, GH	Negative association is present between charity care and incentives in FP, but not for NFP.	Charity care	Pay for performance sensitivity	1996–2006	177 California hospitals
Hartez and Malagueño (2016), <i>MAR</i>	1	Str	NFP	Top managers' personal background influences beneficial effects of alignment between the use of PMS and strategic priorities. Top management emphasis on partnership increases the effect of interactive use of PMS on hospital performance for top-level managers with clinical backgrounds than for managers with administrative backgrounds.	Hospital performance	Diagnostic use of PMS, interactive use, administration, operations, partnership, governance priorities, TMT personal background	2009	117 Belgian hospitals

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APPENDIX A (continued)

Panel D: Link 4: Market Structure and Management Accounting System Design

Author, Year, Journal	Other Links	Theory	Hospital Control	Key Findings	Dependent Variable(s)	Independent Variable(s)	Time Period of Data	Data and Source
Abernethy and Brownell (1999), AOS	1	Str	NFP	Effects of strategic change processes on performance are governed by the extent to which top management uses budgeting interactively, as opposed to diagnostically.	Hospital performance	Strategic change, budget use	1994	Survey of 63 Australian hospitals
Krishnan (2005), TAR	5, 6	Econ	NFP, FP	Type of competition (price or quality) influences the association between intensity of competition and demand for accounting information.	Expenditures on accounting	Competition intensity and type, control, governance	1979–1981 and 1996–1998	460 California hospitals
Evans et al. (2006), TAR	1	Econ	FP	Task characteristics and legal liability influence the form of incentive contracts between managed care organizations and physicians.	Percentage of capitalization revenue	Malpractice cost	1996–1997, 1998–1997, 2000–2001	Gallop Survey of 37,238 physicians
Evans et al. (2010), JMAR	1	Econ	FP	Nonfinancial measures in physician compensation contracts are associated with informativeness, complementary alternative control mechanisms, and external pressures for quality and cost containment.	Likelihood of use of nonfinancial performance measure in compensation	Measurement quality, control mechanisms, external pressures	1996–1997, 1998–1999, 2000–2001, and 2004–2005	Gallop Survey of 13,016 physicians

Panel E: Link 5: Market Structure and Management Accounting Outcomes

Author, Year, Journal	Other Links	Theory	Hospital Control	Key Findings	Dependent Variable(s)	Independent Variable(s)	Time Period of Data	Data and Source
Holzhaecker et al. (2015b), TAR	1, 4	Econ	NFP, FP	Hospital managers make resource procurement choices (outsourcing, leasing of equipment, and increasing the share of contract labor) to increase cost elasticity in the presence of demand uncertainty and financial risk.	Cost elasticity, outsourcing, leasing versus buying, contract labor	Uncertainty, financial risk	2002–2012	2,202 hospital-year observations from California hospitals

Panel F: Link 6: Public Policy and Management Accounting System Outcomes

Author, Year, Journal	Other Links	Theory	Hospital Control	Key Findings	Dependent Variable(s)	Independent Variable(s)	Time Period of Data	Data and Source
Soderstrom (1993), JAPP	3	Econ	NFP, GH	After regulatory change to fixed price, hospitals in better financial condition have fewer admission and reporting errors and hospitals with higher marginal costs have more admission and reporting errors.	Admission errors and reporting errors	Regulatory change, ownership, financial solvency, cost	1985	100 California hospitals

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APPENDIX A (continued)

Author, Year, Journal	Other Links	Theory	Hospital Control	Key Findings	Dependent Variable(s)	Independent Variable(s)	Time Period of Data	Data and Source
Kennedy, Burney, Troyer, and Stroup (2010), JAPP	3	Econ	NFP	Imposition of a minimum threshold for charity care resulted in an increase (decrease) in charity care by hospitals below (above) the threshold. Change in regulation that allowed deduction of bad debts from patient revenue reduced charity spending in hospitals with higher margins.	Charity care as a proportion of revenue	Above or below threshold, total margin	1992–1997	2,593 Texas hospital-years
Holzhaecker et al. (2015a), CAR	3, 5	Econ, Soc	NFP, FP, GH	Fixed-price regulation increases cost elasticity and decreases cost asymmetry. Response stronger in for-profit hospitals.	Change in cost	Change in volume, decrease dummy, ownership	1993–2008	16,186 hospital-years from German Federal Statistical Office

Panel G: Link 7: Regulations and Management Accounting System Design

Author, Year, Journal	Other Links	Theory	Hospital Control	Key Findings	Dependent Variable(s)	Independent Variable(s)	Time Period of Data	Data and Source
Blanchard et al. (1986), TAR	1	Econ	NFP	Hospitals bias their budgets to maximize regulatory revenue allocations.	Change in budgeted cost	Change in budgeted volume	1976–1983	116 hospitals in Washington State
Forgione and Giroux (1989), FAM	3	Econ	NFP, FP	Hospitals' positions on fund accounting standards as evidenced by comment letters to the Healthcare Financial Management Association (HFMA) are influenced by hospitals' economic position and incentives.	Lobby position	Hospital financial status, LOS, patient mix	1984–1985	26 HFMA comment letters
Eldenburger and Kallapur (1997), JAE	1, 3	Econ	NFP	Hospitals use budgeting and strategic cost allocations to shift costs from regulated to unregulated accounts.	Ratio of inpatient (or outpatient) department revenues to total revenues	Regulation, size, patient mix	1977–1991	68 hospitals in Washington State
Eldenburger and Kallapur (2000), JAPP	1, 3	Econ	NFP	Total inpatient department costs decreased relative to outpatient departments in response to regulation. After excluding allocated costs, inpatient department costs increased indicating that strategic budgetary allocations were employed by hospitals to maximize revenue.	Ratio of inpatient (or outpatient) department revenues to total revenues	Regulation, size, patient mix	1977–1991	68 hospitals in Washington State
Kallapur and Eldenburger (2005), JAR	3	Econ	NFP	Firms facing revenue uncertainty due to price regulation will prefer technologies involving low fixed and high variable costs.	Ratio of variable to total costs	Dummy for regulatory change	1977–1994	831 departments in 59 Washington State hospitals

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APPENDIX A (continued)

Author, Year, Journal	Other Links	Theory	Hospital Control	Key Findings	Dependent Variable(s)	Independent Variable(s)	Time Period of Data	Data and Source
Lehtonen (2007), <i>MAR</i>		Soc	GH	DRG-based pricing can be successfully implemented and assist in management control such as cost management, and resource rationing. Inter-departmental variations in use exist.	Longitudinal case study	Longitudinal case study	1999–2000	1 Finnish hospital
Lægreid and Neby (2016), <i>FAM</i>		Soc	GH	DRG and activity-based funding creates gaming behaviors in a multiple accountability regime with complementary mechanisms as well as competing institutional logic.	Qualitative analysis	Qualitative analysis	2003–2012	Norwegian hospitals, data from public documents, press, webpages

Panel H: Link 8: Institutional Forces and Management Accounting Outcomes

Author, Year, Journal	Other Links	Theory	Hospital Control	Key Findings	Dependent Variable(s)	Independent Variable(s)	Time Period of Data	Data and Source
Krishnan and Yetman (2011), <i>JAR</i>	3, 6	Soc	NFP	Nonprofit hospitals facing higher normative (regulative) pressures shift costs to a greater (lower) extent toward program services and away from administrative and fundraising services.	Difference in program service ratio between IRS and OSHPD forms	Institutional factors, firm factors, governance factors	1999–2005	620 hospital-year observations from California hospitals using OSHPD and IRS Form 990 data

Panel I: Link 9: Institutional Forces and Management Accounting Design

Author, Year, Journal	Other Links	Theory	Hospital Control	Key Findings	Dependent Variable(s)	Independent Variable(s)	Time Period of Data	Data and Source
Covaleski et al. (1993), <i>AOS</i>	7	Soc	NFP, FP, GH	DRG and case-mix accounting practices express and demonstrate a conformity with institutionalized rules and expectations.	Theory building	Theory building	Not applicable	Not applicable
Lowe and Doolin (1999), <i>MAR</i>	7, 8	Soc	GH	DRG case-mix-based accounting provides discursive spaces for action by facilitating the framing of issues and justifying or resisting resource allocations.	Case study	Case study	1994–1996	New Zealand public hospital
Hyvönen and Järvinen (2006), <i>EAR</i>	5, 6	Soc	GH	Contract-based budgeting arising from managed care did not change budgetary practices significantly. Rather, prevailing institutionalized practices were incorporated into new ones, became routinized and, finally, institutionalized.	Interpretive case study	Interpretive case study	1996–1998, 2000–2001	1 district hospital in Finland

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APPENDIX A (continued)

Author, Year, Journal	Other Links	Theory	Hospital Control	Key Findings	Dependent Variable(s)	Independent Variable(s)	Time Period of Data	Data and Source
Llewellyn and Northcott (2005), AOS	1	Soc	GH	Reliance on hospital cost benchmarking promotes "averageness" whereby hospitals' activities and processes become average to comply with the norm. Institutional constraints influence transaction cost considerations, and together mediate the effects of cost pressures on outsourcing. Institutional and economic pressures create tensions in mandated hospital network. These tensions include efficiency, legitimacy, catering to the influence of constituent stakeholders, and maintaining consistency between institutional pressures and network goals.	Textual analysis and interpretation of documents, press reports, and working papers	Textual analysis and interpretation of documents, press reports, and working papers	1999–2001, 2001–2002	6 trust hospitals of the U.K. National Health System
Balakrishnan et al. (2010), JAR	3, 4	Econ, Soc	FP, NFP, GH	pressures and network goals. Hospitals of the National Health System exhibit loosely coupled capital asset management systems. Many departments maintained their own asset records and did not integrate with other departments or other systems.	Percent of direct cost outsourced	Hospital type, managed care revenue	2000–2005	1,857 California hospitals
Graffon, Abernethy, and Lillis (2011), MAR		Soc	GH	pressures and network goals. Hospitals of the National Health System exhibit loosely coupled capital asset management systems. Many departments maintained their own asset records and did not integrate with other departments or other systems.	Network design, institutional responses	Institutional pressures	Not provided	3 hospital networks in Australia
Marriott, Mellett, and Macniven (2011), MAR		Soc	GH	pressures and network goals. Hospitals of the National Health System exhibit loosely coupled capital asset management systems. Many departments maintained their own asset records and did not integrate with other departments or other systems.	Loose coupled systems	System characteristics	Not provided	2 Welsh NHS hospital trusts
Kelly, Doyle, and O'Donohoe (2015), FAM		Soc	GH	Socio-economic forces combined with chance events influence hospital, organizational field, and economic/political levels. Pressure from citizens and new management ideas apply at the hospital level.	Case study	Case study	Not provided	26 hospital managers in Ireland

Legend for Theory Type: Econ = Economics; Mgt = Management; SCM = Supply Chain Management; Soc = Sociology; and Str = Strategy.
 Legend for Hospital Control Type: FP = For-profit; NFP = Nonprofit; and GH = Government.