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Contextualist Inquiry into IT-enabled Hospital Revenue Cycle Management: Bridging Research and Practice

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Abstract

Approximately a quarter of all U.S. non-for-profit hospitals operate with negative margins. In this unsustainable situation, revenue cycle management (RCM), the business process that drives revenue collection and accounts receivable administration, becomes increasingly crucial for healthcare organizations. RCM is at the center of an incredibly complex network of external and internal links, and its success chiefly depends on a smooth flow of timely, accurate information. While IS research increasingly focuses on clinical health information technologies (HITs), IT's potential as an enabler of hospitals' administrative activities remains by and large unexplored. To advance research into administrative HIT, we draw on Pettigrew's (1987, 1990) theoretical contextualist framework of organizational transformation. Contextualist inquiry is particularly well suited to the study of complex organizational change processes, and it affords a comprehensive view on the opportunities and challenges involved in transforming IT-enabled RCM. Leveraging these strengths, we review the diverse body of academic literature related to RCM transformation and juxtapose the findings with the prevalent discourse in practitioner publications on RCM. These analyses reveal major gaps between extant theory and the problems faced in practice. In conclusion, we draw on these insights to propose research themes and theoretical lenses that can help bridge the gap between theory and practice.

Keywords: *Need Identification, Administrative Innovation, Administrative Functional Systems, Hospital Revenue Cycle Management, Health Information Technologies.*

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1. Introduction

Across the US, hospitals struggle to maintain a steady cash flow, and hospital leaders have increasingly become concerned about patient revenue collection and account receivable management (Rauscher & Wheeler, 2008). Revenue cycle management (RCM) is at the center of an incredibly complex network of intra-organizational and inter-organizational links and is greatly dependent on a smooth flow of timely and accurate information enabled by information technology (IT) (Manley & Satiani, 2009; HIMSS Analytics, 2010). In light of the different problems threatening hospitals' financial future and the changing regulatory environment, hospitals must find ways to leverage information technologies for transforming processes driving revenue collection.

In this paper, we adopt Pettigrew's (1987, 1990) contextualist inquiry to advance research into the important area of IT-enabled RCM. Pettigrew's framework is particularly well suited for studying complex organizational change process, and it affords a comprehensive perspective of not only the content and process of change but also the context in which transformations unfold. Through the theoretical lens of contextualist inquiry, we examine and juxtapose 229 RCM papers published in practitioner outlets with 107 relevant studies published in academic peer reviewed outlets. With this review strategy, we reveal the existing gap between the academic focus on peripheral issues concerning hospitals' financial viability and the growing and almost existential concern inside the healthcare industry about its own sustainability. This important gap suggests that researchers' increasing attention on the use of clinical health information technology (HIT) needs to be complemented with a similar interest in the optimization of behind-the-scenes administrative operations; otherwise, IT's promise as enabler of improved efficiency and quality of healthcare delivery will not materialize. Indeed, while not the only factor to drive change, thoughtfully reconfiguring and reconceptualizing how IT should be best used to support hospitals' financial health is a crucial piece of the puzzle.

2. The U.S. Healthcare Context

The U.S. health sector is a behemoth worth over $2.6 trillion, which represents almost 18 percent of the country's entire value-production capacity (National Center for Health Statistics, 2014). If nothing drastically changes, the Centers for Medicare and Medicaid Services (2012) has predicted that healthcare's cost will surpass the $4.6 trillion mark by 2020. According to the Center for Disease Control and Prevention (CDC), the average spending per capita on health in the US is $8713; however, its residents are still sicker than their counterparts in OECD countries (Health Policies and Data, 2015). Despite the disproportionately high level of spending, the US is at or near the bottom among industrial countries in its healthcare. The U.S. health sector lags behind in all major healthcare indicators, including maternal mortality, infant mortality, life expectancy, and an assortment of chronic non-communicable diseases ranging from Type 2 diabetes to various respiratory and heart conditions (Anderson & Frogner, 2008). Olsen and Young (2012) have estimated that the U.S. healthcare sector spends $361 billion on administrative costs of which they estimate approximately half to be wastefully mismanaged. Facing $30 billion in shortfalls from Medicare and Medicaid and an increasing rate of self-payer default, healthcare providers face pressures to decrease waste while improving patient outcomes.

Policy makers and practitioners are, therefore, promoting a wide array of health information technology (HIT) initiatives that promise to improve the efficiency and quality of healthcare delivery (Buntin, Burke, Hoaglin, & Blumenthal, 2011). Sensitive to the changes in the field, academic research increasingly focuses on HIT issues (Devaraj & Kohli, 2000; Anderson, Frogner, Johns, & Reinhardt, 2006). So far, however, extant research almost exclusively focuses on investigating IT's clinical potential in improving patients' outcomes and general cost savings (Chaudhry et al., 2006; Romanow, Cho, & Straub, 2012) as opposed to improving hospitals' financial viability. Researching the link between clinical IT and individual patient outcomes is important, but we should acknowledge that it is distinctly different from administrative IT, which impacts both the organization and indirectly individual outcomes. While it is important to recognize that both types of technologies overlap and, at times, are symbiotic, research should not lump administrative and clinical IT together when evaluating

healthcare organizations outcomes because both distinctly differ in their application, adoption process, and impact on financial performance (Menon, Yaylacicegi, & Cezar, 2009).

Improving health outcomes is extremely important but so is improving hospitals' financial health. The American Hospital Association (2011) has estimated that 24 percent of all US hospitals are currently in the red, and that the mean patient revenue has been constantly below the break-even point for the past 20 years for all hospitals. Incurring operational losses is not atypical for businesses. What is atypical is the scope of the problem and its magnitude, which afflicts arguably the most important industry in the U.S. According to a 2011 survey of healthcare providers conducted by Moody's, 63 percent of the nation's not-for-profit hospitals operate with margins that are between breakeven and 5 percent (Mathews, 2011). Seeing their revenue flow worsen in the past several years, short-term acute community hospitals are especially at risk (Schuhmann, 2010). Consistent negative earnings endanger hospitals' viability, slow quality-improvements projects, and prevent other important capital investments needed to meet the continuous growth in demand (Rauscher & Wheeler, 2012). Thus, optimizing the business processes driving hospitals' revenue collection is crucial for the future of hospitals and the healthcare sector as a whole.

The changing landscape of U.S. healthcare will inevitably impact hospitals. The affordable care act (ACA) of 2010 (commonly referred to as "Obamacare") is the nation's biggest healthcare legislation since Medicare and Medicaid, which launched in the mid-1960s. The ACA limits insurance companies' ability to discriminate between patients based on gender, age, or pre-existing conditions. It spells out minimum coverage standards and mandates that individuals without health insurance must purchase coverage. To facilitate greater transparency in the health insurance market, the ACA established health insurance exchange systems in which individuals and companies can compare insurance policies. ACA requires all adults above the age of 26 (it allows 26 year old and younger individuals to remain on their parents' insurance plan) to purchase a health insurance policy. To assist low-income families with the cost, ACA expands Medicaid subsidies by reducing its eligibility threshold. The reform has already contributed to expanding health insurance coverage to 10 million Americans who were previously uninsured (Quealy & Sanger-Katz, 2014), a positive development for hospitals that now can expect a larger portion of their patients to be able to pay for care. On the other hand, the ACA's ripple effects are not yet clear, and it is possible that some of the insurance companies that experience decline in profitability will offset their losses by increasing deductibles and lowering the quality of coverage. Higher deductibles mean that hospitals will have to collect a greater proportion directly from patients, which can be potentially disruptive to their revenue flow because approximately 40 percent of the self-paid portion of healthcare bills are never paid (Thiry, Evans, Walter, & Ramanathan, 2011). In addition, the law imposes new high standards on hospitals by reducing their Medicare reimbursements because of readmissions or subpar patient satisfaction surveys. Those penalties especially affect community hospitals that serve a high proportion of sickly patients; small rural hospitals seem to be most negatively affected so far (O'Donnell & Ungar, 2014). At this point in time, it is unclear yet how healthcare delivery and reimbursement models will evolve in the future.

The revenue cycle nests at the heart of the hospital operation, which, in turn, is at the center of the healthcare industry, which itself is at the heart of the U.S. service economy. Considering the financial struggles of U.S. hospitals, examining IT-enabled RCM is, therefore, academically intriguing and, perhaps more importantly, essential directly for clinical practice and societal welfare in general. In this paper, we investigate the realm of the nexus between IT and the business of healthcare and leave the gate ajar to those who wish to take a peek.

3. Revenue Cycle Management

RCM in healthcare refers to the process of collecting revenue and tracking claims. While healthcare providers come in different forms that include outpatient clinics, physician groups, rehabilitation centers, nursing homes, dentist clinics, and other entities selling clinical care, we focus on RCM in hospitals. RCM begins when a patient contacts or comes into the hospital, and it includes multiple administrative activities aimed to collect payments for services rendered (HIMSS Analytics, 2007). Several model describe the exact stages of the revenue cycle that mostly differ in their level of depth and breakage into sub-processes but that have similar main components. Generally, RCM comprises

the functions of patient scheduling, registration, clinical encounter and documentation, medical charge coding, charge billing, payment posting, and late revenue recovery (Figure 1) (Manley & Satiani, 2009; Singh, 2011).

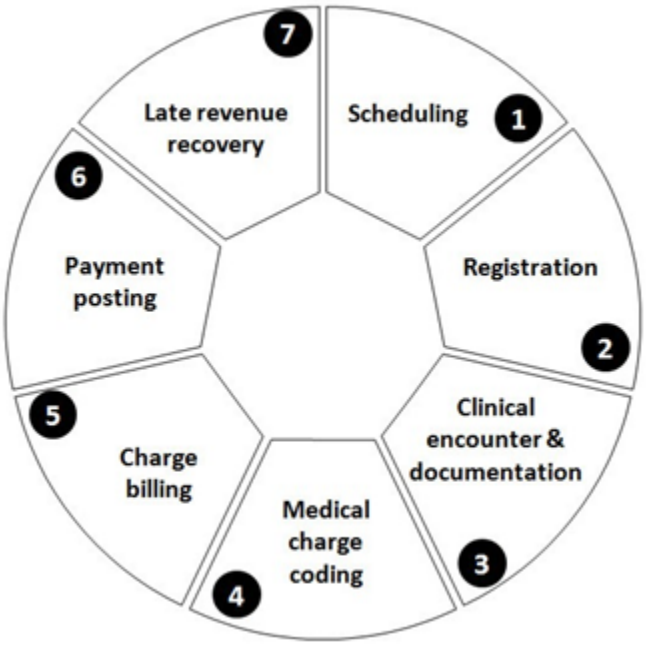

Figure 1. The Revenue Cycle Stages

3.1. IT's Enabling Role

RCM is increasingly streamlined and processed in real time, and it requires the support of an assortment of IT interacting with different internal and external information systems (HIMSS Analytics, 2010). The technologies used range from simple Excel spreadsheets to vastly more complex, fully integrated enterprise content management (ECM) and business process management (BPM) software to connect the flow of information among the different components of the cycle. Table 1 describes the basic activities of RCM and exemplar technologies used.

Hence, RCM is a technically complex process, and it includes everything from verifying patients' identity and insurance eligibility to collecting co-pays and accurately coding charges. Coding itself is extremely complex (Campbell et al., 1997; Campbell, Campbell, Grimshaw, & Walker, 2001) and requires large investments in technology and personnel training, which are challenging for financially strapped healthcare providers (Moczygemba & Fenton, 2012; Stanfil, Williams, Fenton, Jenders, & Hersh, 2010). The switch from the ninth version of the international classification of disease (ICD-9) medical classification system (a universal coding scheme used for patient diagnosis) with its current 13000 codes to the more detailed ICD-10, which comprises 68000 highly specified codes, poses a challenge to many healthcare providers (Newell & DeSilva, 2013).

RCM's intricacy is at odds with the requirement of timely performance. Many relatively complicated tasks must be completed in a relatively short time. A hospital's speed of revenue collection is directly tied to its overall performance and ability to grow as an organization (Rauscher & Wheeler, 2008). The massive flow of information inside the cycle and outside of it is impossible to manage manually with traditional paper-based tools; thus, effective IT infrastructure is crucial (Colpas, 2013). Practitioners recognize, as we show in greater detail later, the importance of effectively introducing IT and frequently discuss the best ways of incorporating it into RCM. Realizing that old in-house legacy systems do little to reduce the complexity, hospital leaders increasingly adopt the next generation of

technology. While anecdotal evidence from the practitioner literature suggests that new revenue-cycle IT can dramatically improve revenue collection (e.g., Castellano & Scibetta, 2005; D'Eram0 & Umbreit, 2005; Drake & Kane, 2009), it also suggests that results vary widely because some decision makers find it difficult to match their organization's unique contextual circumstances with the right specific technology solution (Gale, 2009)

Table 1. Revenue Cycle Stages, Definitions, and Examples of IT Used

Revenue cycle stage	Definition	Examples of IT used
1. Patient appointment scheduling	Contact with a new or established patient to set a meeting for providing clinical services.	Enterprise-wide scheduling software, online patient and physician appointment request portals
2. Patient registration	Verifying patients' identity, contact information, and coverage eligibility at the time they arrive to an appointment.	Online insurance verification with real-time responses, registration quality assurance tools, or quality assurance (QA) logic in registration system
3. Clinical encounter & documentation	Documenting all the examinations, procedures, and medical services provided to patients.	Electronic medical records system, automated alerts, case manager application, workload and productivity monitoring system, voice-recognition system, computerized physician order entry (CPOE)
4. Medical charge coding	Standardized charge coding according to the appropriate diagnosis-related grouping (DRGs) of the information recorded at the clinical documentation stage.	Charge entry application, integrated EMR system with coding, automated reports
5. Charge billing	Converting the coded charge into a bill that is sent to the patient and their medical insurance provider.	Online electronic billing system, interface with online Medicare-compliance system, biller-specific productivity and error reporting
6. Payment posting	Posting all payments received from patients and their medical insurance provider to their individual accounts.	Online system comparing expected vs. actual payments, bank lockbox
7. Late revenue recovery	Recovering late or denied payments from the patients and/or their insurance provider.	Web-enabled third party payer inquiry system, online "receivables work station" system, automatic download and upload from and to the HIS system, IS for information exchange with collection agencies

3.2. RCM's Strategic Role

Strategically located at the core of the hospital financial engine, the revenue cycle is simultaneously impacted by external regulatory factors and, at the same time, implicated in all the major intra-organizational processes, including human resources management and IT diffusion. Without well-functioning RCM, hospitals cannot adequately implement necessary (and necessitated) upgrades to their IT infrastructure, including electronic medical records (EMRs) and electronic health information exchange systems (HIEs). The U.S. Federal Government provides some incentives, but they are not always enough for cash-strapped hospitals—some of whom increasingly must engage in short-term borrowing just to manage their payroll (Maizel, 2009). The problem is especially evident in rural areas

where the local populace depends on hospitals not just for healthcare but also for their livelihood (American Hospital Association, 2011). Rural hospitals, typically not given the kickbacks received by many urban hospitals for trauma designation and teaching status, are naturally disadvantaged for their relative low patient traffic while having the duty to remain open to the public at all times. Shortfalls in revenue diminish hospitals' ability to invest capital into crucial experimentation with new clinical IT, such as telemedicine or smart grid infrastructure, which can potentially improve patient outcomes and financial performance in the long run. One cannot expect hospitals to spend money they do not have on experimenting with innovation that is not immediately needed; however, without it, the likelihood for improving outcomes decreases.

The past four decades of revenue management research mostly focuses on the airline, car rental, hotel, and dining industries but neglects revenue management in healthcare (Chiang, Chen, & Xu, 2007). Still, the revenue-collection process in the U.S. healthcare sector is fundamentally different in its level of complexity from all other industries, and it costs at least three times more to administer (Blanchfield, Heffernan, Osgood, Sheehan, & Meyer, 2010). Administrative processes and systems in hospitals tend to be fragmented into separate silos, which leads to revenue leakage and collection delays (Greenwalt & Thomas, 2006). The complex nature of services (which can rapidly change depending on patients' circumstances), the constantly changing contract terms with third party payers, and the complex coding system regularly cause inaccurate payments in healthcare (Kantz, 2006). Hospitals' dependence on third party payers such as government agencies and private insurance companies for revenue flow reduces their level of control over their own cash flow (Blanchfield et al., 2010). The healthcare industry is not the only sector that relies on third party payers for its cash flow, but its predicament is nonetheless unique. Unlike universities and other service providers heavily relying on someone besides the customer to foot the bill, hospitals cannot deny or hold back services to patients in need of medical attention. Treading lightly on the line between being the stewards of social institutions that are held to high ethical standards and being a business with all that entails (payroll, taxes, investment portfolios, capital investment needs, and other operations), hospitals face the challenge of balancing quality-of-care and cash-flow needs.

Thus, the hospital revenue cycle operates under uncertain conditions not found in any other financial management process for several reasons. First, in most cases, those who receive the service—patients—do not directly pay for it. Private insurance companies and government programs directly negotiate and pay 87 percent of the bills (Medicare Payment Advisory Commission, 2013). Second, hospitals are legally required to provide medical service to those who seek it regardless of their ability to pay (because of the Emergency Medical Treatment and Active Labor Act of 1986). Third, prices are more or less meaningless as third party payers almost never pay the official charge (Anderson, 2007). Fourth, it usually takes anywhere between 30 to 60 days for the hospital to receive a payment after it has submitted the claim, and there is no guarantee that the claim will be paid in full. To illustrate the problematic conditions hospitals operate in, one needs only to imagine how the Ritz Carleton would fare in the hypothetical scenario in which it must provide rooms to anyone who enters its doors while knowing they cannot afford to foot the bill and that some third entity might or might not pay for services rendered.

Fundamentally, health services' providers and payers operate in a zero-sum economic arrangement (Porter & Teisberg, 2004); that is, the first has a direct incentive to artificially inflate services to increase revenue, while the later has the incentive to challenge as many services as possible to reduce reimbursement. This tug-of-war in pricing and reimbursements directly affects those who are not covered and are, thus, expected to pay the inflated prices in full (Anderson, 2007). Unsurprisingly, many self-paying patients, likely to be poor as it is, simply default and give the hospitals no choice but to further inflate charges to attempt to cover their losses. Documentation becomes the main weapon in the clash of interests between providers and payers who use it to protect their own turf at the expense of the other (Chavanu & Newman, 2006). On the one hand, providers are inclined to "over document" to capture as much revenue as possible. On the other hand, payers devote much of their energy and resources to detect inconsistencies and technical mistakes in documentation to avoid paying fees as much as possible. In an attempt to standardize documentation, the U.S. Federal Government, through providing special grants acting as carrots and promising to reduce payments

acting as sticks, pushes healthcare providers to adopt EMRs and electronic health records (EHRs). The almost simultaneous switch from ICD-9 to ICD-10, together with the launching of the healthcare reform and EHR compliance deadlines, has left many U.S. healthcare providers scrambling to find their footing. Not all change is negative though. The improving economy and the increase in coverage of previously uninsured patients due to the Affordable Care Act are all good news (Perez, 2013), yet administrative complexity seem to remain a major problem. Neither legislation nor clinical-side innovation are enough to increase the U.S. healthcare sector's efficiency and it becomes increasingly clear that in order to achieve significant improvements, the industry must transform its behind-the-scenes bureaucracy, including administration and revenue-collection activities. In this paper, we start a more serious discussion on how we can leverage IT to achieve better outcomes not only for patients but also for the institutions serving them.

To summarize, improving healthcare's efficiency and patient outcomes largely depends on the transformation of RCM as the bridge between public health policy and IT implementation and as the mechanism that facilitates change inside hospitals. RCM depends heavily on smooth information flow inside hospitals (mainly accurate documentation and proper coding) and effective information flow with the symbiotic but also systemically conflicted external agencies (mainly private insurance companies and government programs). The enormous transaction cost of processing claims is a drag on hospitals' financial performance and on society as a whole. Hospital leaders have increasingly recognized the need to leverage IT for transforming RCM (e.g., Leenheer, 2012; Wagner, 2012) but face many problems in selecting and subsequently implementing it. Hospitals currently cover their losses by borrowing (when it is possible) and by generating income from additional—non-patient care—sources such as investment portfolios, donations, gift shops, parking fees, cafeteria, and vending machines (McKay & Gapenski, 2009; Schuhmann, 2010), however, these sources cannot offset the decades-long trend of negative patient revenue.

4. Analyzing the Literature

To reveal what we know about IT-enabled RCM and discover what directions to take in future HIT research, we reviewed both the academic and the practitioner literature. We casted our net wide in accordance with Pettigrew's (1987, 1990) contextual framework to include a plurality of RCM related material. Our inclusive analysis includes literature that examine the inner and outer context affecting hospitals' financial performance, the transformation processes affecting hospitals' financial performance, and RCM's content broken down into its distinct components. We followed Webster and Watsons' (2002) recommendation that a comprehensive and meaningful literature review must systematically select papers and encompass insightful analysis of significant themes and concepts across the sample.

4.1. Analytical Framing

Although the academic literature doesn't focus directly on RCM issues with few exceptions (though notable exceptions include Rauscher & Wheeler, 2008, 2010, 2012), it nonetheless addresses many relevant topics contextually related to hospitals' financial performance. Practitioners often cite RCM's complexity as the main factor driving the acquisition of administrative HIT (e.g., Canfield & Johnston, 2002) so understanding this complexity better is important both to theory and practice. Hence, we chose to employ contextualist inquiry (Pettigrew, 1987, 1990) to organize a diverse body of literature under a singular theoretical framework that would allow the reader to better understand the diverse issues impacting RCM and the complex conditions under which it operates. Pettigrew, drawing on established traditions in anthropological research, asserts that, when examining any major transformation in organizations, one has to do so in a complete manner that requires using different lenses. The lenses of analysis should thoroughly zoom in and zoom out on the context in which the transformation occurs, the process driving the transformation, and, naturally, the transformation's specific content or components. Table 2 provides our adaptation of Pettigrew's concepts of contextual inquiry to IT-enabled RCM. Hence, in our analysis of the practitioner and academic literature, we identify papers addressing inner- and outer-context factors impacting the financial viability of hospitals, papers related to the content of the revenue cycle broken into its basic activities as specified in Table 1, and papers concentrating on processes driving the improvement of hospitals' financial performance.

Table 2. Analysis Framework

Construct	Pettigrew (1987)	Adaptation
Outer context	"Social, economic, political and competitive environment in which the firm operates" (p. 657)	Various external influences directly affecting hospitals' RCM, including market conditions and competition, governmental programs and regulations, and technological developments.
Inner context	"Structure, corporate culture, and political context within the firm through which ideas for change have to proceed" (p. 657)	Organizational culture, work relations, governance structures, and other "in-house" affairs that directly affect RCM in hospitals.
Process	"The actions, reactions, and interactions from the various interested parties as they seek to move the firm from its present to its future state" (pp. 657-658)	Variety of change-promoting actions conducted in hospitals that directly affect their overall financial performance and RCM.
Content	"The particular areas of transformation under examination" (p. 657)	The components of the revenue cycle: patient scheduling, registration, clinical encounter and documentation, medical charge coding, charge billing, payment posting and late revenue recovery.

We identified 229 practitioner and 107 academic papers according to Pettigrew's (1987, 1990) framework and coded them according to the four analysis categories (see Table 2): outer context, inner context, process, and content. Further, we classified the process papers according to whether they represented variance research or process research (Mohr, 1982; Van de Ven, 2007). Variance studies generally examine the relationship between variables involved in a change process by taking a singular snapshot of data, whereas process research longitudinally examines the actions through which transformations unfold in a specific context (Markus & Robey, 1988). In addition, we subcategorized each paper according to its relation to the different stages of the revenue cycle (Table 1) and whether it directly addressed issues concerning IT. Appendix A presents the complete coding of the 107 academic papers with a total of 54 context papers (28 outer context and 26 inner context), eight process papers (two process studies and six variance studies), and 45 content papers. Approximately 27 percent of the papers explicitly addressed issues concerning IT. Readers can find the complete list of practitioner literature sorted according to years and source can at http://revenuecycle4.blogspot.com/.

To enhance our analysis, we also used a text-mining tool, Leximancer, to conceptualize structures and themes across the selected papers (Cretchley, Rooney, & Gallois, 2010). Researchers are increasingly using this advanced software in social science research to analyze large bodies of texts (e.g., Hewett, Watson, Gallois, Ward, & Leggett, 2009; Martin & Rice, 2007; Smith & Humphreys, 2006). Leximancer employs different algorithms for detecting the frequency of words, their order in the text, and their relation to other words, and it helps translate these analyses into maps that visually show links between major concepts and themes found in text. The software clusters closely related concepts together in themes (as bubbles), and the size of bubbles and the relative distance between them indicate relations between concepts and themes. To arrive at each map presented in the paper, we iteratively employed Leximancer's path-analysis function to reveal conceptual maps related to the themes of our contextualist inquiry. In this way, Leximancer helped us detect relationships between concepts we might otherwise have overlooked (Smith & Humphreys, 2006), and it allowed us to identify gaps between theory and practice by subsequently comparing the discourse on RCM in the academic literature with the discourse in practitioner health-management journals. In Appendix B, we provide a tutorial guide for using Leximancer to benefit other researchers who might be interested in employing it in their research.

4.2. Selecting Literature

As the business process at the heart of one of the most important industries in the US, RCM is heavily discussed by multiple industry-related outfits, including healthcare IT news websites, practitioner publications, HIT and revenue cycle solutions vendors, health industry research firms, and other professional organizations. To determine overlap and gaps between the academic and the practitioner discourse related to IT-enabled RCM, we identified 229 practitioner papers and analyzed them according to Pettigrew's (1987, 1990) framework. Using the search term "revenue cycle" (on Ebscohost), we selected papers from three different sources: 1) Healthcare Financial Management (HFM), a trade publication of the Healthcare Financial Management Association; 2) Health Care Registration (HCR), the newsletter for healthcare registration professionals; and 3) Health Management Technology (HMT), another industry newsletter that presents the latest news and developments in technology in the health management field. The selected papers were published between 2003 and 2012. To avoid saturation, we limited our selection to journals that focused on issues of administration revenue cycles, financial performance, and IT the most.

We also sampled relevant academic literature addressing hospitals' financial performance. Transformation of RCM is an emerging topic in academia, so the literature is fragmented and relates to many research domains. To capture as many relevant pieces as possible to construct a useful picture of IT-enabled RCM, we used multiple search words and three different academic search engines. To capture different angles on the factors impacting hospitals' financial trajectory, we did not discriminate between sources as long as the findings were published in a peer reviewed journal. We did exclude papers that addressed hospitals' financial performance outside the U.S. healthcare context and papers that addressed the financial aspect of hospital performance only peripherally. Following Webster and Watsons' (2002) recommendations, we also reviewed the papers' citations to include additional important papers. We identified a total final sample of 107 papers (for more details on the literature-selection procedure and the full coded sample, see Appendix A). In Section 5, we juxtapose the practitioner and academic literature.

5. Insights from the Literature

In this section, we present the results of our contextual review of the practitioner and academic literature on RCM transformation with a particular focus on IT-enabled RCM. We begin with a bird's-eye view on what we know about the outer-context level and progressively zoom in to examine the inner context, organizational process, and specific RCM content levels.

5.1. Outer Context of RCM Transformation

The contextualist analysis of the practitioner and academic literature revealed two main categories of influence: government impact and market impact based on 28 academic papers (26% of the sample) and 31 practitioner papers (13% of the sample). Whereas the practitioner literature looks at how outer-context events drive IT-enabled RCM, the academic literature mostly focuses on the indirect tie between outer-context factors and healthcare performance. This gap illustrates that practitioners hold a practical view of outer-context factors: they perceive them as the business environment in which they operate and to which they need to adjust without analyzing them. Table 3 summarizes the key points that emerged from the literature.

Both literature streams address government programs and regulations, but, whereas the academic literature generally finds evidence of their benefits to financial performance, practitioners generally perceive them as distractions that they have no control over. Some practitioners perceive new regulations and government reforms as opportunities for initiating IT-driven transformation of RCM (Egusquiza, 2003; Janiszewski, 2011) while others focus on the challenges caused by the changes and look for ways to mitigate their impact (Glaser, 2011; Sorrentino & Sanderson, 2011). The ACA brings greater complexity to RCM as coverage shifts and patients become directly responsible for paying greater portions of their bill due to increased deductibles. Practitioners generally recognize that the ACA requires major changes to RCM IS and are still on the fence regarding its potential

benefits. On the one hand, changes to RCM IS are disruptive and costly. On the other hand, the promise of increased coverage and reduction in indigent (charity) care can potentially boost income.

Table 3. Key Findings Related to Outer Context of RCM Transformation

Academic literature	Practitioner literature
Medicare and other U.S. Federal Government incentives are positively associated with financial performance, while deregulations negatively affect hospitals' revenue.	Changing regulatory environment poses many challenge for hospitals, but it is also an opportune time for transforming RCM. Generally addresses Medicare and Medicaid much less.
Increased market competition from free-standing clinics, HMOs, and specialty hospitals negatively impacts hospitals' financial performance.	Does not address competition
Competition drives hospitals to shift capacity from less profitable areas to more profitable areas of care.	Does not address competition
Targeted marketing can increase admissions and improve occupancy.	Does not address marketing
Outsourcing administrative and managerial functions has a neutral net effect on financial outcomes.	Discusses the benefits and cost of outsourcing of RCM functions.
Inconclusive evidence regarding the impact of hospitals' integration and financial performance.	Addresses the challenges of assimilating clinics and aligning their RCM IS with the hospital system
Does not address IT vendors.	General attitude of caution toward IT vendors who "overpromise and underdeliver".
Addresses the shortfalls of reliance on private insurance companies for bill payment but does not go into specifics of information exchange needs.	Addresses the shortfalls of relying on private insurance companies for bill payment but does not go into specifics of information-exchange needs.

Academic research and practitioners offer different perspectives on Medicare—the U.S. Federal Government's social insurance program covering citizens older than 65 and the disabled. Practitioners generally address Medicare as a burden to their financial performance and decry its decreasing levels of reimbursement (e.g., Showalter, 2014), whereas academic research finds Medicare to be an important financial bloodline for hospitals. Medicare payments positively impact the bottom line of for-profit and non-for-profit hospitals (Friedman & Shortell, 1988). More recent research discovers that Medicare reimbursements have become the preeminent source of income for hospitals and surpassed reimbursements from private insurers and self-payers (Freidman, Sood, Engstrom, & McKenzie, 2004). Moreover, Rauscher and Wheeler (2010) found that hospitals that served a relatively higher proportion of Medicare patients as opposed to hospitals that served higher proportions of privately insured and self-paying patients were reimbursed faster and collected more revenue. In general, government kickbacks in the form of tax credits and higher reimbursements for hospitals designated as trauma care facilities are very important to hospitals' bottom line. In their study, Li, Schneider, and Ward (2009) demonstrate how struggling rural hospitals that transitioned to become designated as critical access hospital enjoyed a significant boost in their profitability. Jordan (2001) detected the opposite effect in New Jersey hospitals that had seen decline in their profitability following a transition from prospective payment system to a free market system. Similarly, Hultman (1991) found that rural hospitals and investor-owned hospitals experienced a drop in profits following deregulation and a shift away from Medicare's prospective payment system.

Both streams of literature only scratch the surface of market factors' impact on RCM. The practitioner literature mostly focuses on the technical challenges of assimilating clinics into hospital systems (i.e., aligning and integrating their RCM IS with hospitals' systems). Standardizing RCM processes, policies, and tools and scheduling and documentation practices are keys for successful assimilation (Lewins & Chapdelaine, 2007; Sorrentino & Sanderson, 2011). The academic literature finds conflicting evidence regarding the question of whether system affiliation and integration increases financial performance. While some of the academic papers addressing the issue of ownership structure find system membership, risk sharing, and other forms of integration as advantageous to hospitals' financial performance, other studies find limited evidence to such a relationship. Strategic hospital alliances generate more revenue; however, the increase in patient revenue does not improve cash flow as costs rise as well (Clement et al., 1997). Correspondingly, risk sharing among hospitals is associated with an initial increase in operating margins, but this effect diminishes and disappears with time (Nauenberg, Brewer, Basu, Bliss, & Osborne, 1999). Although the relatively few hospitals affiliated with a national healthcare system enjoy improved financial performance (Tennyson & Fottler, 2000), most hospitals do not experience financial performance improvement due to integration (Burns & Pauly, 2002). Contrary to those findings, other studies find evidence that centralized hospital networks generally enjoy higher revenue per admission and higher overall financial performance in comparison to free-standing hospitals (Bazzoli, Chan, Shortell, & D'Aunno, 2000; Wilcox-Gök, 2002). To the extent that free-standing hospitals enjoy financial stability, it is usually due to their advantaged geographic location at the heart of affluent areas (McCue & Diana, 2007). Environmental local conditions are important contextual factors impacting RCM.

Other outer-context factors impacting hospitals' revenue cycle performance include IT vendors, insurance companies, and competitors. The U.S. healthcare sector is highly fragmented and plagued with misaligned incentives that drive up costs (Cebul, Rebitzer, Laylor, & Votruba, 2008) and create a market in which pricing for services is chaotic and uncompetitive (Reinhardt, 2006). The academic literature finds that increasing competition from free-standing clinics, healthcare maintenance organizations (HMOs), and specialty hospitals further squeeze hospitals' thin margins (Berenson, Bodenheimer, & Pham, 2006; Cimasi, Sharamitaro, Haynes, & Seiler, 2008; Dranove, Shanley, & White, 1993; Thorpe, Seiber, & Florence, 2001). One major reason why free-standing clinics pose an increasing challenge is improvements in clinical technology, which allows them to safely perform procedures that hospitals previously exclusively covered (Berenson et al., 2006). Some evidence suggests that hospitals react to increased competition by shifting capabilities toward highly profitable areas of care while reducing capacities in less profitable areas (Dranove et al., 1993; Jordan, 2001). While the practitioner literature does not directly focus on competition, it nonetheless addresses other important issues that are not examined in academic research, such as IT vendors and insurance companies. The practitioner literature asserts that hospitals need to do a better job of leveraging IT for tracking unsubstantiated denials from insurance companies to improve billing (Todd, 2003; Welter, Semko, Miller, & Lauer, 2007). However, IT vendors often overpromise but underdeliver (Greenwalt, 2004), and hospital leaders find it difficult to select the right technology. The practitioner literature recognizes IT's importance for RCM but also warns against over reliance on vendors (Stockamp, 2006). This sentiment is echoed in academic research that finds no evidence of gains in profitability from outsourcing administrative functions (Danvers & Nikolov, 2010). What does seem to work is having competent management. For example, Douglas and Ryman (2003) found that skilled managers that know how to leverage connections can establish an advantageous, competitive position for their hospitals.

To corroborate and complement these findings, we compare the practitioner's and academic literature's conceptual Leximancer maps side by side (Figure 3). The practitioner map reveals two outer-context factors we overlooked in our manual analysis. It shows a direct link between physician practices and RCM, which suggests that outpatient clinics have a direct impact on the hospital financial performance. In addition, the path analysis illustrates a connection between suppliers, costs, and revenue cycle performance. The expanded practitioner map (not shown) shows secondary links between vendors, insurance companies, and government programs (Medicaid and Medicare) with RCM, which suggests that these external factors are related but not extensively addressed. The academic map reveals a close association between Medicare, Medicaid, and revenue, which

emphasizes the importance of those programs to hospitals' bottom-line. Market competition, the hospital industry, and insurance companies are also linked to revenue indirectly. While the practitioner literature incorporates IT as a factor impacting RCM, the academic literature does not specifically address IT and focuses more on market variables and government programs.

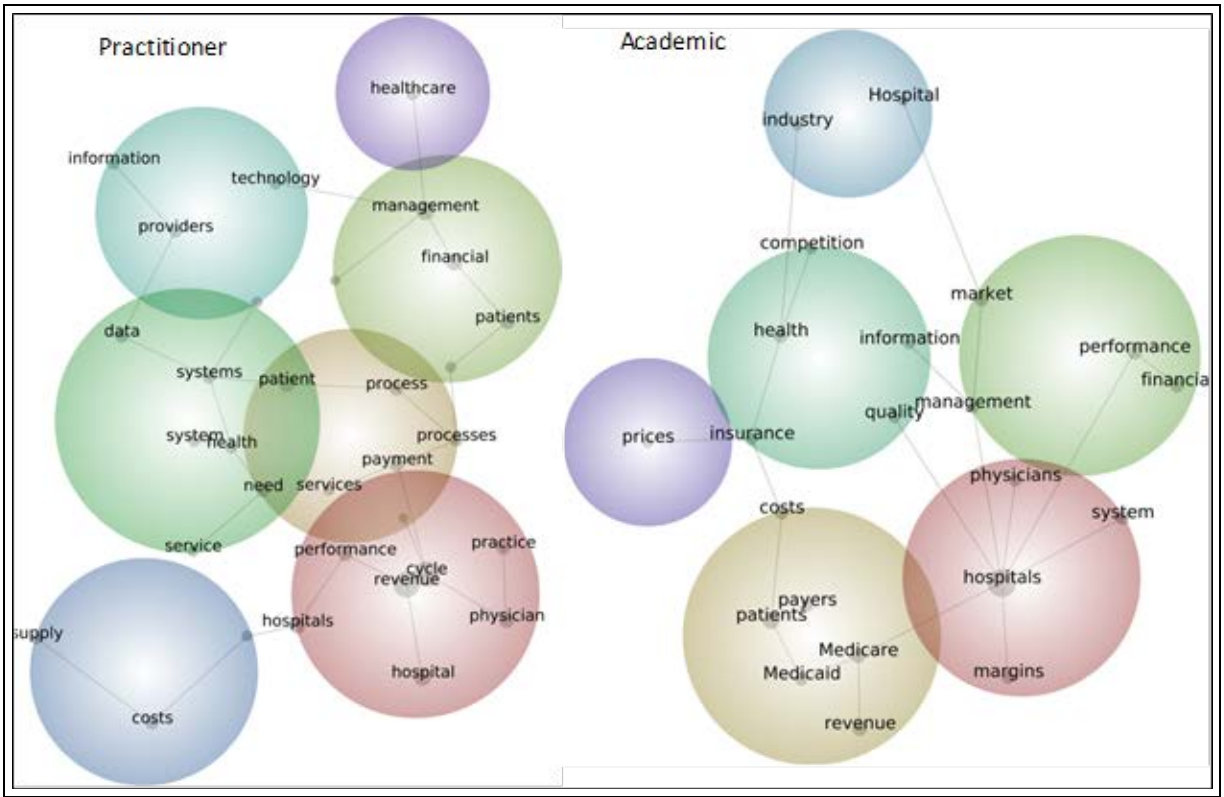

Figure 3. Leximancer Conceptual Map Comparison for Outer Context

5.2. Inner Context of RCM Transformation

Here, we identified a total of 26 academic papers (24% of the sample) and 78 practitioner papers (34% of the sample). The analysis of these papers reveal several areas of concern related to the relationship between internal organizational factors and RCM transformation, including IT, training and education, organizational culture, personnel engagement, and coordination across the hospital. Table 4 summarizes the key points from our analyzing the two literature streams.

The practitioner literature extensively discusses IT's role in transforming RCM. Practitioners examine ways of leveraging existing systems for improving revenue cycle (Wagner, 2012). For instance, one suggestion is to use the vast body of collected data to determine patterns related to billing and ways to improve charge collections. Increasingly recognizing that fax-based communication should no longer be part of RCM (Kuchkca-Craig, 2010) and that old in-house systems fail to provide the needed functionality (McBride, 2004), practitioners also discuss acquiring new systems for supporting administrative function at length. Such RCM solutions should generally provide real-time information, reduce errors and duplications (Buysman, 2010), facilitate cost control (Glaser & Sett, 2012), integrate the main campus back office with outpatient clinics (Hallowell & Turisco, 2009), integrate existing systems in the hospital (Mayer, 2007), facilitate compliance with regulations (Nelson & Levitt, 2006), and monitor performance (Johnson, 2006). Investing into new RCM IT is costly, and the challenge of selecting the right IT solution is a recurring concern among practitioners (e.g., Guyton & Poats, 2004; Hammer & Franklin, 2008). Each healthcare organization operates under a unique set of circumstances and no one single formula for identifying the right administrative IT exists. Some of the practitioner literature suggests steps for selecting technology (e.g., Pillittere, 2006), but they are mostly simple generic recommendations.

Table 4. Key Findings related to Inner Context of RCM Transformation

Academic literature	Practitioner literature
Does not specifically addresses RCM. Technology adoption generally positively affects financial performance in the long run but can be a drag on profitability in the short run.	Recognizes the need for RCM transformation through acquiring new IT or better using existing IS infrastructure.
Experience and engagement with IT are important factors impacting hospitals' profitability.	Extensively training personnel on RCM IT is essential to improve profitability.
Generally addresses the problem of IT implementation in hospitals.	Focuses on the challenge of identifying the right IT to support RCM.
Focuses on IT as a tool for avoiding errors only in a clinical context.	Focuses on IT as a tool for avoiding early errors to in RCM processes.
Addresses the dissonance between having the right IT and its meaningful use.	Addresses the dissonance between having the right IT and its meaningful use.
Addresses the need to use IT for costs control on the administrative and clinical side.	Addresses the need to use IT for controlling costs on the administrative and clinical side.
Provides limited evidence on the importance of training of coders.	Extensively focuses on the need for better training of RCM personnel.
Finds evidence as to the high cost of communication failure in hospitals.	Addresses communication problems between RCM's administrative and clinical sides.
Organizational culture and politicking impact IT adoption.	Addresses how resistance-to-change culture negatively impacts RCM.
Addresses the importance of performance benchmarking in general.	Addresses the need for effective RCM performance benchmarking for identifying areas for improvement.
Physicians impact revenue by controlling resource usage, and their involvement in governance improves hospitals' financial performance.	Pays less attention to physicians specifically but extensively address the need to create a culture of cost awareness among all staff.
Quality improvement indirectly improves profitability.	Revenue leakages result from small errors in documentation of auxiliary services such as pharmacy and lab charges.

While not specifically addressing administrative technology, the academic literature finds that IT integration is overall positively associated with financial performance. IT enables hospitals to swiftly turnaround patients, which increases the latter's satisfaction and allows hospitals to maximize efficiency by reducing the idle time of expensive medical machines and patient rooms (Devaraj, Ow, & Kohli, 2013). Patient satisfaction becomes increasingly tied to hospitals' performance evaluations and subsequent reimbursements. The practitioner literature cites patient satisfaction as one of the driving factors behind investment into IT-enabled RCM (Canfield & Johnston, 2002; Gilreath & Burns, 2004; Gustafson, 2002), and evidence that modest quality-improvement initiatives increase both patient satisfaction and hospitals' overall financial performance exists (Alexander, Weiner, & Griffith, 2006; Vélez-González, Pradhan, & Weech-Maldonado, 2011). While the academic literature generally finds that technology is important for financial outcomes, it also finds evidence to administrative IT adoption's difficulty, which, on average, takes up to four years before being fully integrated or yielding financial return (Menon et al. 2009). Investing into IT is often costly and negatively impacts profitability in the short run before paying dividends (Devaraj & Kohli, 2000, 2004). Thus, decision makers'

expectations and the timing of RCM transformations must consider that return on investment is not immediate.

The academic literature finds that HIT's impact on hospitals' financial performance depends on the selected path of adoption, which, in turn, is often affected by organizational politics. For instance, Spaulding, Furukawa, Raghu, and Vinze (2013) found that realigning personnel significantly impacted financial performance more than automating tasks. The emphasis on IT adoption as a social process goes hand in hand with the notion of organizational power structure precariousness. Wurster, Lichtenstein, & Hogeboom (2009) found that, before improving financial performance, IT implementation must overcome a culture of resistance to change and inner politicking. Echoing a similar outlook, the practitioner literature also addresses questions of organizational culture of resistance to change and the likelihood of successful RCM transformation (e.g., Louge, 2004; O'Brien, 2008). Both literature streams address the importance of engaging personnel for improving coordination and increasing sensitivity to costs and other RCM-related processes. Practitioners assert that promoting a culture of willingness to try new approaches and tools that acknowledges and rewards behavior that produces positive results is crucial for improving RCM outcomes (Stockamp, 2004). The academic literature pays special attention to physicians and finds evidence of their importance for improving processes and controlling costs. IT-enabled cost control can help reduce administrative expenditures but has little impact on clinical expenditures, which clinicians mostly control (Pizzini, 2006). Empirical studies find that hospitals in which physicians actively involved in their governance are likely to outperform hospitals in which physicians play only marginal roles in decision making (Goes & Zhan, 1995; Molinari, Morlock, Alexander, & Lyles, 1993; Molinari, Alexander, Morlock, & Lyles, 1995). Although less focused specifically on physicians, the practitioner literature also suggests that involving physicians in improving processes can improve RCM (Shapiro, Cullen, Callanan, Robinson, & Barbier, 2004). More inclusive in their attitude, practitioners wish to see greater engagement and commitment to improving RCM processes from clinical and administrative staff alike (Schoen & Najera, 2012).

The academic literature finds that HIT must be properly used before impacting clinical or financial performance. Directly tied to outcomes, the level of employee engagement with technology varies across hospitals (Devaraj & Kohli, 2004). Similarly, the practitioner literature asserts that EHR must be used as intended before it can contribute to reducing costs (Amatayakul, 2005). Closely tied to functional usage, empirical research finds that experience with technology is associated with improved financial performance. The length of usage and experience with the specific technology is essential for increasing profitability, while possessing a wide array of IT is less impactful (Setia, Setia, Krishnan, & Sambamurthy, 2011). Effectively using IT for increasing output depends on the relevant personnel's training. For instance, Moczygemba and Fenton (2012) found that proper documentation practices and training of coders improved outcomes. While academic research into training's importance is limited, practitioners often cite engaged training as a condition to effectively use IT for RCM (Hoagland, Zar, & Nelson, 2007; Mayer, 2007; Nelson & Levitt, 2006).

Not necessarily unique to hospital RCM, the challenge of creating a work environment that is characterized by open communication but that is also well monitored for accountability is a recurrent concern in the practitioner literature. Establishing key performance metrics is important for identifying underperforming RCM areas that need extra attention (Clark, 2008; Hammer, 2007; Newitt & Robertson, 2007). Practitioners discuss implementing automated systems for monitoring performance and assert that, to be successful, they must incorporate clear metrics and rapid feedback capabilities. However, to be truly impactful, the automated system must be complimented by a culture of openness, accountability, and collaboration (Johnson, 2006).

Technology facilitates communication, and information flow between different employees in a hospital directly impacts RCM. Practitioners address miscommunication as one of RCM's problems (e.g., McBride, 2004). Consistent with that notion, Agarwal, Sands, and Schneider (2010) found that U.S. hospitals waste over $12 billion annually as a result of communication inefficiency among care providers. An average hospital loses $2.2 million, while large, more than 500 bed, hospitals lose $4 million—a significant sum that can make the difference between being in the red or in the black for

many struggling hospitals. The authors conclude that proper technology has the potential to improve communication processes between hospital employees. They do not specify which technologies or how they should be selected, which opens an avenue for examining specific IT-enabled information flows in the RCM context. A hospital's working environment is dynamic and fragmented both between and inside the clinical and administrative parts. Hence, better understanding communication patterns and how they can be improved is crucial for supporting IT-enabled RCM.

Finally, we compare the conceptual Leximancer maps (Figure 4). The practitioner literature map shows links between several key inner-context variables and RCM, which include personnel training, process improvement, creation of metrics, physicians, employees, and patients. Patient emerge as the most major theme, which calls attention to the fact that, at the end of the day, hospitals revolve around patient care and RCM has to consider their many circumstances and needs. Each patient is different in regard to their medical condition and their coverage, which can range from none at all to "Cadillac" plans and a multitude of coverage options in between. The path analysis of the practitioner map shows that technology impacts performance of organizational processes, which, in turn, impact the revenue cycle. Leximancer also shows a link between information systems, data, and process improvement. Those paths confirm IT's centrality as a major factor impacting RCM. The academic literature, while not directly addressing revenue cycle, also finds a close link between IT and financial performance. In addition, the academic literature suggests a direct link between implementation and financial performance. Similarly to the practitioner literature, the Leximancer map of the academic papers sample shows a close link between hospital staff (and leadership) and financial performance. Finally, the Leximancer path analysis also clearly shows that technology is associated with productivity and investment value, a relationship that goes both directions because capital investment impacts the IT-adoption process.

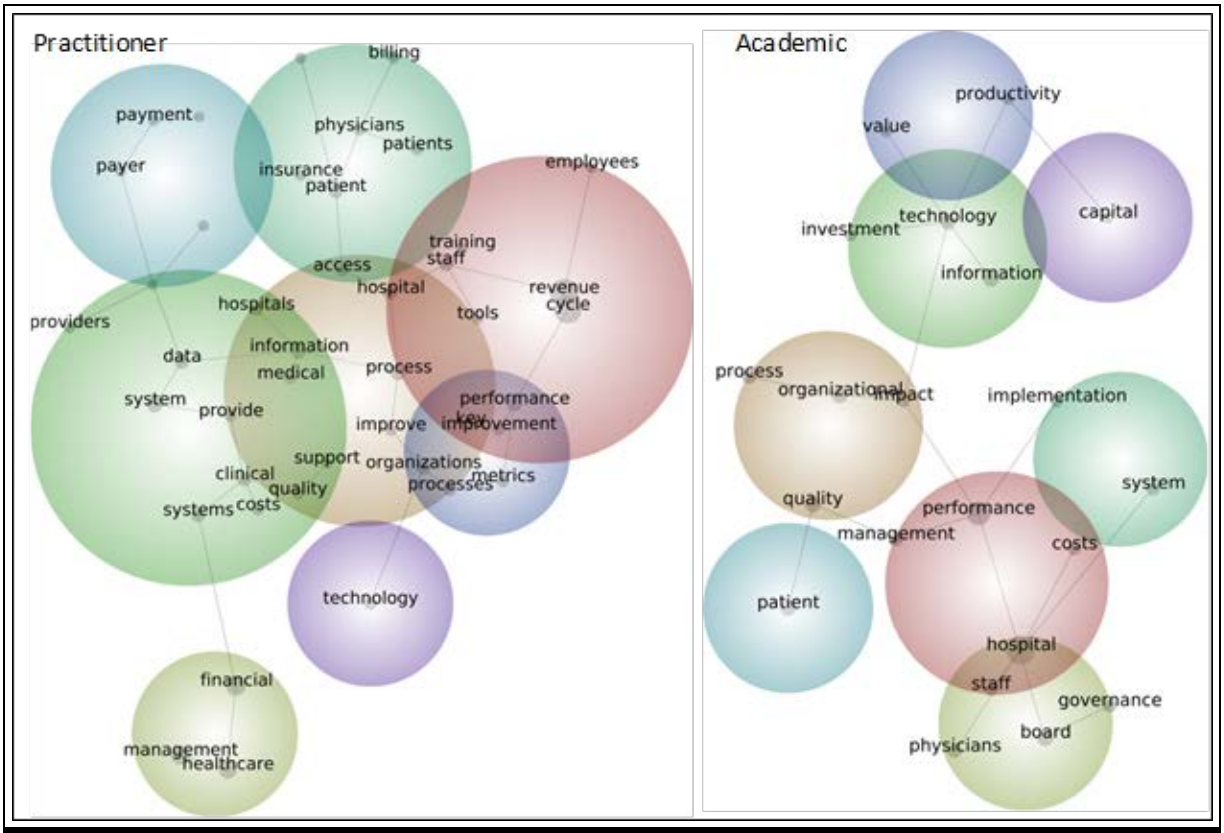

Figure 4. Leximancer Conceptual Map Comparison for Inner Context

5.3. Process of RCM Transformation

The difference between inner-context and processes papers is that the first address internal aspects of hospital operation that impact profitability while the latter address the impact of transformation processes on financial performance. Though we make the distinction, we also acknowledge a certain degree of overlap between the two. We identified eight academic papers (7% of the sample) and 29 practitioner papers (13% of the sample) as process oriented. The shortage in process studies suggest that there are opportunities for future HIT research in that direction. Whereas the practitioner literature mostly centers on IT adoption and process standardization related to RCM, the academic literature looks generally at non-administrative IT adoption and examines how outsourcing and downsizing impact hospitals' financial performance. Table 5 summarizes the key points from both literature streams.

Table 5. Key Findings Related to Process of RCM Transformation

Academic literature	Practitioner literature
HIT adoption has a positive effect on financial performance.	RCM IT adoption has a positive effect on financial performance.
Sequence of technology adoption affects financial performance.	Sequence of technology adoption affects financial performance.
Does not address standardization and centralizations.	Standardizing and centralizing processes viewed as essential for RCM.
Mixed evidence on the impact of outsourcing IT functions on financial performance.	Overall positive, yet cautious, attitude toward outsourcing certain RCM functions.
Physician cooperation is important for change implementation.	Does not directly address the role of physicians in improving processes.
Personnel downsizing has a neutral effect on financial performance.	Does not address issues related to downsizing.

Similarly to the inner-context papers, the theme of the positive impact of technology adoption on profitability also emerged in the reviewed process research. While not specifically addressing administrative IT, the academic literature finds a connection between IT adoption and hospitals' financial performance (Irwin, Hoffman, & Lamont, 1998; Menachemi, Burkhardt, Shewchuk, Burke, & Brooks, 2006). The practitioner literature provides several examples of administrative IT overhaul's positive impact on hospitals' bottom line (Danielson & Fuller, 2007; Drake & Kane, 2009)). For instance, the University of North Carolina hospitals reduced their accounts receivable time by nine days and saved almost $7 million after implementing an automated receivables management information system (Castellano & Scibetta, 2005). Similarly, introducing an automated claim management system in Hawthorn Medical Associates (HMA) in Dartmouth, Massachusetts, increased cash flow by 7 percent, reduced denials by 26 percent, and reduced days in account receivable by 16 percent (Nivison, 2008). Case studies have also found that technology enhances documentation and helps to diminish claim denials (Cruze, 2008), improves price transparency (Williams, 2008), improves registration and verification transaction (Waymack, & Lohse, 2006), improves data integration (Hammer, Langford, & Riefner, 2007), and enhances process standardization (Henciak, Fontaine Fields, & Parks, 2010). Viewing revenue collection in hospitals as a continuum rather than a set of isolated event (Laforge & Tureaud, 2003), practitioners seek out ways of using IT for standardizing the process under a single central system (Best, Byars, Grankowski, & McSpadden, 2010; Clark & Bang, 2012; Morton & Halley, 2010). The reality, however, is that current IT solutions are not capable of encompassing all functions (Gale, 2009), and a mixture of different systems must be used.

Both literature streams address the importance of what sequence hospitals should adopt IT to achieve the best financial performance. While not directly addressing RCM, the academic literature

discovers that hospitals that first implement complex IT infrastructure transformation are more likely to benefit financially than hospitals that follow a patchier IT-adoption pattern (Angst, Devaraj, Queenan, & Greenwood, 2011). The practitioner literature addresses the importance of the proper sequence when adopting EHRs and asserts that they must be implemented in stages to avoid disrupting RCM (McDermott, Franzak, & Little, 2012). The practitioner literature also emphasizes the importance of using well-defined metrics for gauging RCM performance prior to initiating the transformation (e.g., Drake & Kane, 2009).

While the practitioner literature provides some field case studies that examine the relationship between change and RCM, only two academic papers in our sample represent longitudinal field process studies (Breslow et al., 2004; Kohli & Kettinger, 2004). Breslow et al. (2004) tracked over time how the introduction of telemedicine technology in a hospital intensive care unit (ICU) impacted patient outcomes and financial indicators. Kohli and Kettinger (2004) examined the adoption process of an electronic physician profiling system. They observed how management's efforts of facilitating a feedback environment characterized by openness and trust positively impacted physicians' willingness to adhere to a technology that, at first, was perceived as threatening to their autonomy. The system's successful implementation resulted in improved financial performance (Kohli & Kettinger, 2004). Whereas Kohli and Kettinger provide a positive example of a successful case of trust creation, Mark et al. (1998), looking at 1458 hospitals in a variance study, found a direct association between hospitals' attempt to modify physician behavior and decreased margins. Mark et al. (1998) identify a problem, while Kohli and Kettinger (2004) provide a case study showing how one hospital was able to avoid it. Both studies echo our analysis of the inner-context papers, which shows physicians as significant organizational power brokers who directly impact hospitals' financial performance.

Shoring up relations with physicians is not hospital leaders' only priority. Mark, Evans, Schur, and Guterman (1998) found evidence that increasing mid-level management's (department heads) autonomy, authority, and financial responsibilities is associated with improved margins. Their findings are especially interesting in light of the fact that some hospitals seek to outsource managerial and administrative functions to improve financial performance. The practitioner literature addresses issues of outsourcing RCM functions as a way to improve its efficiency. Similarly, the academic literature asserts that some hospital leaders believe that outsourcing will decrease their cost and improve their margins (Roberts, 2001). However, two separate studies found no evidence that outsourcing actually improves financial performance (Danvers & Nikolov, 2010; Menachemi, Burkhardt, Shewchuk, Burke, & Brooks, 2007). Downsizing is another strategy hospitals increasingly adopt to save costs, and, while there is no shortage of research examining the impact of downsizing on work relations, patient access, and quality of care (e.g., Aiken, Sochalski, & Anderson, 1996; Brown, Arnetz, & Petersson, 2003; Brownell, Roos, & Burchill, 1999; Greenglass & Burke, 2000), we identified only one study looking at downsizing's financial outcomes. Chadwick, Hunter, and Walston (2004), examining the practice and its financial impact among rural hospitals, discovered that 15 percent of the hospitals in their study actively downsized their staffing without seeing financial benefits. Though we found a limited number of papers on the topic, we conclude that neither downsizing nor outsourcing guarantees improved financial performance. On the other hand, introducing IT in a well-planned manner that considers sequencing and the human element is more likely to yield positive financial outcomes.

The practitioner Leximancer conceptual map confirms that technology is directly tied to process improvement of RCM (Figure 5). The path analysis also confirms that training staff and physicians is closely associated to RCM transformation. The practitioner Leximancer map also shows a triangular relationship between manemgent, IT, and RCM, which suggests that management impacts IT selection and that IT is tied with RCM. The map also shows that recording information and data are indirectly associated with process improvement. The Leximancer conceptual map of the academic literature demonstrates the direct link between both technology and downsizing and performance. It also reveals a tight relationship between changes in IT management and control of organizational processes and systems and performance. Further, echoing Pizzini (2006) in the inner-context section, the Leximancer map shows the relationship between physicians, cost, and quality. Once again, patients emerge as strong themes in both maps, which suggests that RCM transformation processes should consider them.

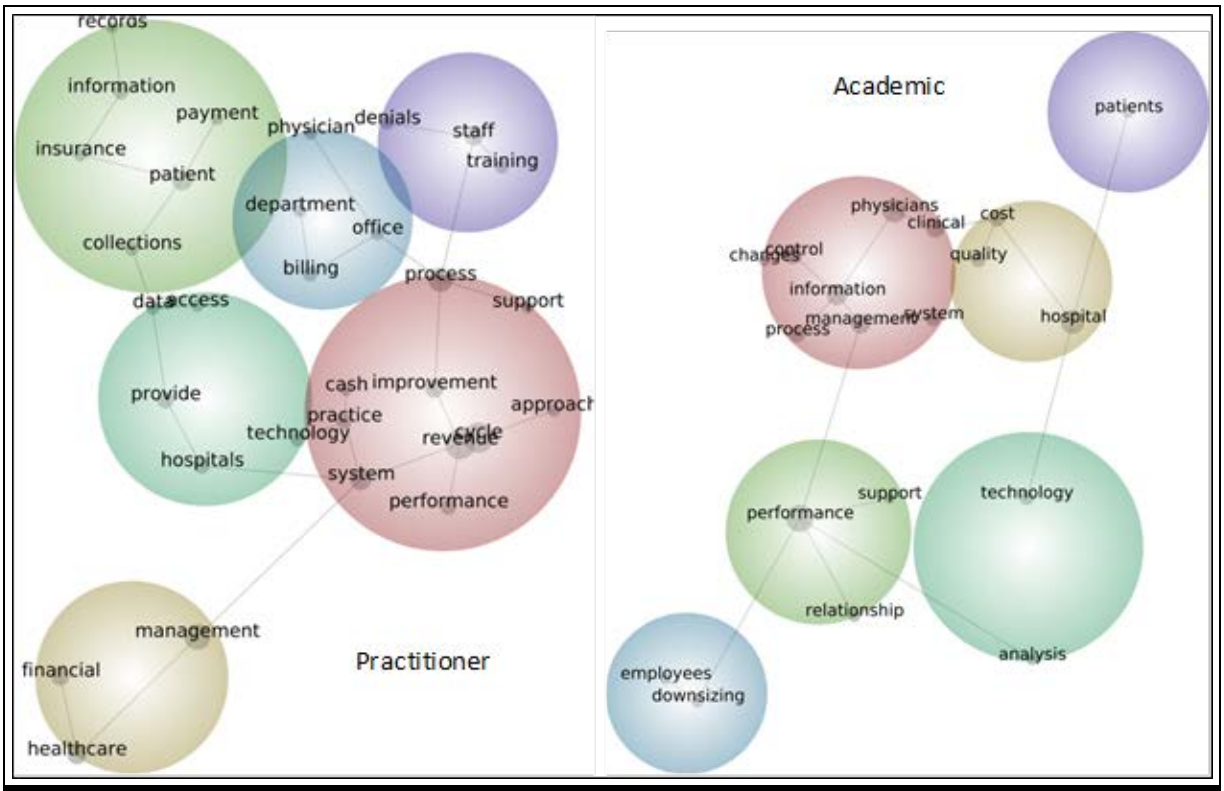

Figure 5. Leximancer Conceptual Map Comparison for Process

5.4. Content of RCM Transformation

We identified 45 academic papers (42% of the sample) and 62 practitioner papers (27% of the sample) as content related. We divided content papers according to revenue-cycle activities (Figure 1). Only 14 of the academic papers are empirical studies (the rest were mathematical models and descriptive papers), and only two directly address IT, which suggests a gap in our knowledge of RCM activities. On the other hand, the practitioner literature address RCM stages in much detail and focuses significantly on IT's role in optimizing their operations. Table 6 summarizes the key points from both literature streams.

Practitioners increasingly discuss the benefits of IT-enabled transformation of patient registration and scheduling for optimizing revenue collection (Shorosh, 2012). Approximately 40 percent of medical bills' self-paid portion is never paid, so, instead of trying to collect this portion after hospitals render the service, practitioners (when it is feasible) increasingly focus their efforts on collecting the self-paying portion upfront (Kapel et al., 2004; Thiry et al., 2011). Unlike registrars in the past, front-end administrators increasingly carry out a diverse and complex range of activities, including verifying insurance coverage, pre-approving procedures, retrieving patients' credit scores, and determining patients' eligibility for charity (Callahan, 2008; Fiedberg, 2007). Automating different aspects of those task save time and labor (Bolster, 2005; Fleischer & Bertch, 2006). Convenient preregistration IS increases patient satisfaction and improves revenue collection down the road (Langford, Dye, Moresco, & Reifner, 2010). While not specifically addressing registration issues, the academic literature confirms the financial benefits of a well-designed appointment-scheduling scheme that balances fixed capacity and patient flow (Gupta & Lei, 2008; Muthuraman & Lawley, 2008). Yet, the literature mostly provides a wide assortment of mathematical design-science papers of scheduling systems that are not tested in real-time field conditions.

Table 6. Key Findings Related to Content of RCM Transformation	
Academic literature	**Practitioner literature**
Only two papers examine the direct connection between scheduling and revenue.	Efficient scheduling that uses an online-based portal and that manages call volume reduces revenue loss.
Multiple design-science papers propose schemes for optimizing how hospitals schedule patients without addressing the registration stage.	Preregistration and access control are important for reducing administrative errors and are key for efficient RCM.
Proper documentation is important for service-coding purposes and efficiently recovering revenue.	Proper documentation is important for service-coding purposes and efficiently recovering revenue.
Proper coding requires training and is important for billing.	Proper coding requires training and is important for billing.
Does not address standardization or metrics.	Standardizing and centralizing processes viewed as essential for RCM.
Does not address information exchange along the stages of RCM.	Information exchange along the stages of RCM is essential for its success.
Limited evidence on the positive relationship between training and effective coding.	Training is crucial for RCT. IT can be used for facilitating training and education.

Practitioners increasingly discuss the benefits of IT-enabled transformation of patient registration and scheduling for optimizing revenue collection (Shorosh, 2012). Approximately 40 percent of medical bills' self-paid portion is never paid, so, instead of trying to collect this portion after hospitals render the service, practitioners (when it is feasible) increasingly focus their efforts on collecting the self-paying portion upfront (Kapel et al., 2004; Thiry et al., 2011). Unlike registrars in the past, front-end administrators increasingly carry out a diverse and complex range of activities, including verifying insurance coverage, pre-approving procedures, retrieving patients' credit scores, and determining patients' eligibility for charity (Callahan, 2008; Fiedberg, 2007). Automating different aspects of those task save time and labor (Bolster, 2005; Fleischer & Bertch, 2006). Convenient preregistration IS increases patient satisfaction and improves revenue collection down the road (Langford, Dye, Moresco, & Reifner, 2010). While not specifically addressing registration issues, the academic literature confirms the financial benefits of a well-designed appointment-scheduling scheme that balances fixed capacity and patient flow (Gupta & Lei, 2008; Muthuraman & Lawley, 2008). Yet, the literature mostly provides a wide assortment of mathematical design-science papers of scheduling systems that are not tested in real-time field conditions.

Poor documentation is the leading cause of denied claims (Adams, Norman, & Burroughs, 2002; Manley & Satiani, 2009), and both literature streams agree on the importance of effective documentation when providing clinical care for collecting revenue downstream (Ballentine, 2009; Spring et al., 2007). As documentation becomes increasingly digitized through electronic medical records (EMRs), it directly impacts hospitals' financial performance (Smith, Bradley, Bischeschu, & Tremblay, 2013) and improves patient outcomes with relatively little cost (Gilmer et al., 2012). Despite some initial resistance, most clinicians steadily adopt EMRs (Miller & Sim, 2004); however, training staff is a challenge (Hicks & Gentleman, 2003). The practitioner literature addresses documentation during clinical encounters as well and asserts that it is one of the main areas needed to be improved for RCM (Egusquiza, 2007; Hedman & Riefer, 2007; Napiewocki & Dowling, 2006; Richmond, 2011). Directly related to documentation, practitioners discuss the need to improve data exchanges and collaboration between clinical and RCM staff. One of the challenges is to get physicians to fully comply with documentation protocols (Swindle, 2006). Properly documenting auxiliary services such as pharmacy and various lab test procedures is another important area for improvement that can potentially reduce revenue leakage (Morgan & Brown, 2005).

Once the clinical staff properly documents all procedures and services rendered, accurately coding the documented information directly ties to a hospital's ability to issue a bill (Adams et al., 2002; Ballentine, 2009; Manley & Satiani, 2009; O'Malley et al., 2005; Reinhardt, 2006). The practitioner literature addresses challenges related to clinical charge coding such as training personnel, integrating coding IT and transitioning from ICD-9 to ICD-10, which Leenheer (2012) refers to as one of "the greatest transformations in the industry's recent history". The practitioner literature warns against overrelying on technology for coding and asserts that it must be complimented by well-trained and preferably experienced human expertise. Training emerges as a crucial factor for RCM transformation across all content stages in practitioner literature, which also finds a bi-directional link between effective using IT and training (IT can help train personnel). Contrary, the academic literature provides only one single pilot study that illustrates the relationship between the training of clinical coders and positive financial outcomes (Moczygemba & Fenton, 2012).

After coding, the billing department contacts patients and third party payers requesting a payment for services provided, which include nursing and medications (Kim & Giachetti, 2006; Welton, Fischer, DeGrace, & Zone-Smith, 2006). Both literature streams address the problematic triad between patients, hospitals, and insurance companies that is plagued with conflicting interests that lead to grossly uneven billing (Anderson, 2007; Melnick & Fonkych, 2008; Reinhardt, 2006; Robinson, 2011). Practitioners, increasingly aware of healthcare billing's absurdities (Clarke, 2011), try to find ways to communicate better with patients and third party payers to align expectations (Hammer, 2006; Todd, 2003). However, uncompensated care (unpaid bills) is on the rise (Zimmerli, Craghead, & Gupta, 2010) and even the simplest coordination tasks with insurance companies often fail. For instance, the industry's failure to standardize the format of the issued health insurance card (which widely varies) causes much confusion in registration, which sometimes lead to billing delays. The academic literature suggests streamlining and standardizing billing across hospitals as a way to improve efficiency in billing (Blanchfield et al., 2010; Schmitz, 1999). Practitioners actively look for better ways to leverage IT to improve billing with tools such as an automated accounts receivable reporting package (Powell, Hindman, & McMillan, 2009) and tools preventing inappropriate claim submissions to third party payers (Braccili, 2009). Another proposed way to increase efficiency in billing is to use predicative analytics on the vast stores of patient data hospitals accumulate to determine the likelihood of payment recovery (Bradley & Kaplan, 2010). Identifying types of patients can assist hospitals to increase efficiency by tailoring their bill-collection efforts (Eller, 2008).

Lastly, the academic literature does not address issues about posting payments or recovering late revenue. On the other hand, practitioners recognize their importance for RCM. Highly fragmented manual-payment processes for posting and reconciling payments generate significant administrative costs and fees for providers. Posting payments has increasingly moved from paper-based to electronic transactions directly transferred from third party payers to a hospital's bank account (Casillas, 2009). Transitioning from paper-based to electronic process can potentially save as much as $35 billion and 2.5 billion pieces of paper annually (Casillas, 2009). To recover revenue from defaulting patients, hospitals use outside collection agencies. The problem of using collection agencies is that they employ "aggressive" tactics that upset and alienate patients. Moreover, collection agencies take a substantial portion of recovered payments. Hospital leaders increasingly discuss the need to transform the way they recover unpaid bills to be more patient "friendly" and "compassionate" (Gundling, 2012). One proposed solution is to create an in-house late revenue recovery agency (Godden, 2008).

The supplemental Leximancer practitioner map shows documentation as a central theme (Figure 6). It also shows other RCM content activities in the practitioner literature, which include coding, registration, and billing. Technology systems and tools are closely tied to RCM in general and to its components in particular. Technology is directly tied to support of departments, registration, documentation, coding, and billing. A path analysis also shows the link between IT and physicians through clinical documentation, which suggests that physicians impact RCM through documentation. The Leximancer academic literature conceptual map demonstrates a direct link between EMRs and revenue, which emphasizes the importance of properly keeping records for collecting payments. Similar to the practitioner literature, the academic literature has a link between documentation coding,

billing, and reimbursements. Additionally, the map shows a link between staff and errors in documentation, which suggests that training relevant personnel determines documentation practices, which, in turn, are essential for continuing the entire process. Leximancer positions scheduling and ICD further away from reimbursement or revenue collection, which suggests a gap in academic research. Both maps position patients as a central theme along all RCM activities. The biggest difference between the two maps is the absence of technology from the academic literature, which suggests a gap in the literature and an opportunity for future HIT research.

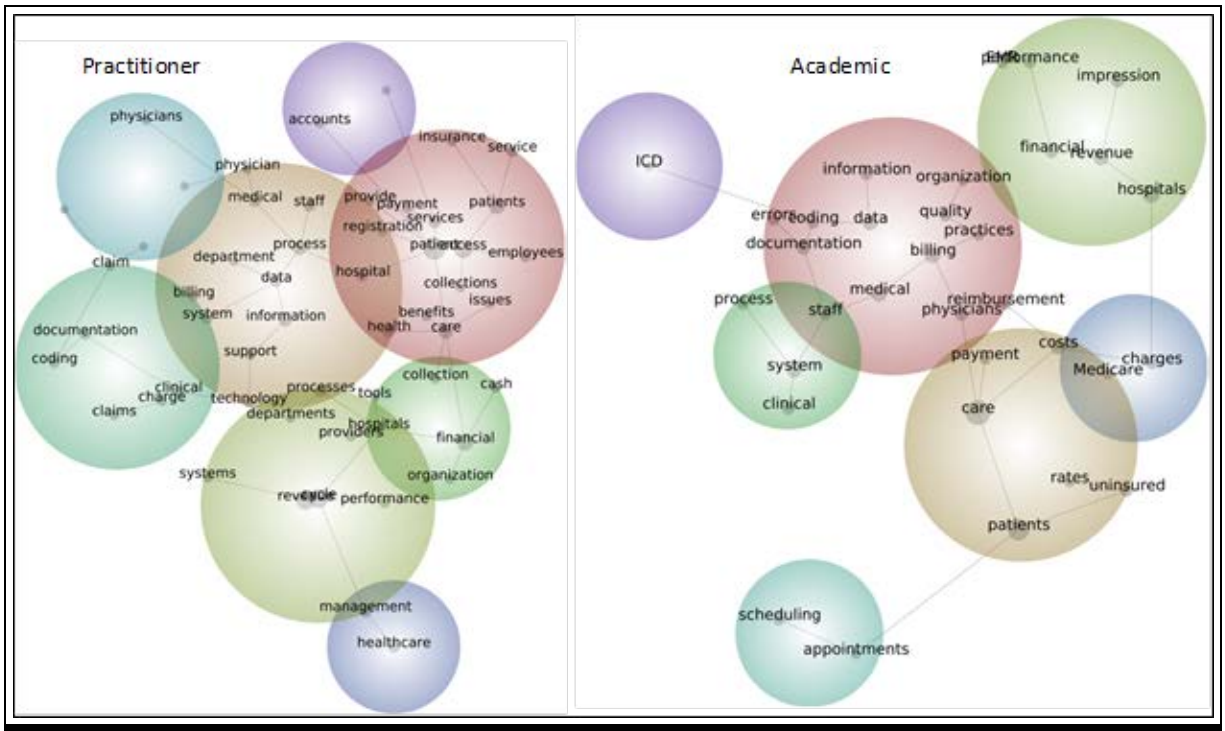

Figure 6. Leximancer Conceptual Map Comparison of Content

6. Bridging Research and Practice

From analyzing the academic literature and the practitioner literature and comparing them, we have uncovered a blue ocean of research opportunities (Straub, 2009) related to IT-enabled RCM. In this section, we draw on the contextual framework (Table 2) and key findings from comparing the two literature streams (Tables 3-6) to derive propositions and research questions that can inspire and guide future HIT research into this important area.

6.1. Outer Context

Our investigation into outer-context issues reveals that many different external factors impact RCM. Whereas the academic literature focuses on the impact of government programs, regulations, and market competition on hospitals' profitability, it neglects other important links that the practitioner literature we reviewed addresses. The revenue cycle is uniquely sensitive to fluctuations to its cash flow caused by third party payers. Each hospital has a different set of mostly opaque and secretive contractual relationships with multiple healthcare insurance companies, which makes standardizing reimbursements impossible. Depending on local market conditions, each hospital has a diffident leverage (Devers et al., 2003), and it is not uncommon to find that hospitals located next to each other significantly differ in their contractual reimbursement rates (Ginsburg, 2010). There are at least three crucial information-exchange junctions between hospitals and insurance companies that can benefit from enhanced automation, data management, and IT support. These junctions include the point of care preauthorization prior to the clinical encounter, claim submission in the billing stage, and the periodic negotiation stage during which hospitals and insurance company representatives readjust

reimbursement rates. As for now, HIT research has made no serious attempt to examine those important links. In addition, the ACA promises to increase price transparency in the system, which provides another important opportunity for examining how information availability impacts hospitals' RCM.

Another increasingly important outer-context link that exerts much influence on RCM is hospitals' ties with outside IT vendors. Hospitals generally rely on multiple IT vendors that provide different services related to RCM that range from data storage to ongoing support of different RCM-related IT. Some vendors are more closely involved with their clients (if the client chooses to pay for it), and others provide the IT without maintaining an ongoing relationship with hospitals. The variety in systems, their age, capabilities, interfaces, and overall quality creates compatibility issues. We assert that more deeply examining how information exchange and collaboration with IT vendors affects the hospital revenue cycle could potentially yield important insights. In Table 7, we present propositions we derive from our outer-context literature analysis and a corresponding research agenda question.

Table 7. Outer-context RCM Propositions

Proposition 1:	Information flow between a hospital's back office and its relevant external actors is a fundamental element impacting RCM performance.
Proposition 2:	Information flow with external actors in RCM must be timely and error free to reduce claim denials and maximize revenue-collection efficiency.
Proposition 3:	Adopting a targeted IT for RCM increases the speed of information flow and reduces errors in interactions with external actors.
Claim:	IT is essential for facilitating requisite interactions with external actors to improve RCM performance.

Proposed research question: How can IT architectures and portfolios of IT solutions address information processing requirements of hospitals' RCM in relation to external actors?

6.2. Inner Context

The practitioner and academic literature find many different inner-context variables affecting hospitals' RCM, such as organizational culture, communication, personnel training, self-assessment practices, and organizational governance. Whereas the practitioner literature addresses the connection of inner-context variables to administrative IT, management, and RCM performance, the academic literature focuses more broadly on clinical IT without zeroing in on hospitals' cash flow needs. Extant findings in the academic literature on clinical IT and technology assimilation in general can provide an important stepping stone for future research tailored specifically to examine the link between technology, personnel training, organizational culture, and RCM. Our analysis of the practitioner literature reveals many different possible links that render themselves to future examination. In Figure 7, we suggest one basic model that could help frame research into those relationships by focusing on the connection between personnel commitment attitudes to RCM performance and the effective use of IT that eventually leads to enhanced revenue collection. Specifically, the practitioner literature and the academic literature suggest that, while commitment is important, high-quality training and actual engagement with the technology must supplement it, both of which are moderated by the overall organizational culture of openness to innovation. Table 8 summarizes some key inner-context propositions, and Figure 8 overviews one variation of our suggested theoretical model.

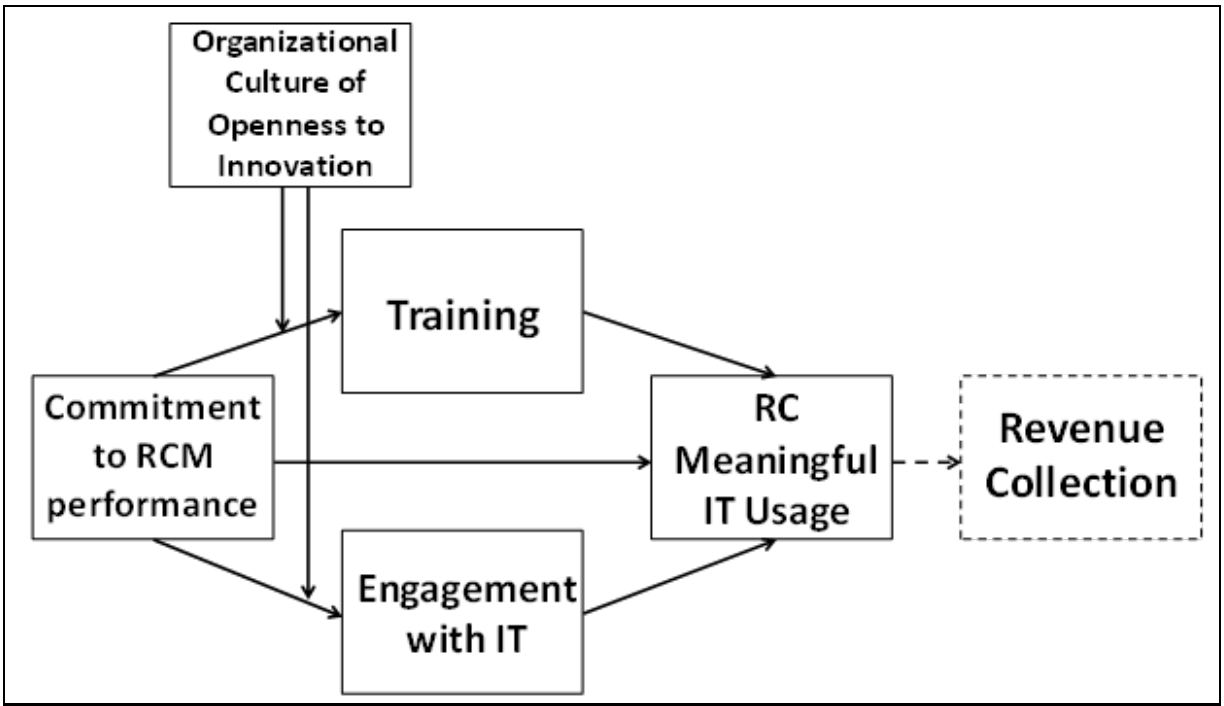

Figure 7. Proposed Inner-context Model

Table 8. Inner-context RCM Propositions

Proposition 1:	Effective RCM IT usage leads to enhanced revenue collection in hospitals.
Proposition 2:	Personnel commitment to RCM performance positively impacts effective RCM IT usage.
Proposition 3:	The effect of personnel commitment to RCM performance on effective RCM it usage is moderated by an organizational culture of openness to innovation.
Proposition 4:	Personnel commitment to RCM performance impacts effective RCM IT usage through training and engagement with RCM IT.
Claim:	An organizational culture of openness to innovation and a collective commitment to RCM performance, effective training, and high level of engagement with technology lead to meaningful revenue cycle IT usage and subsequent revenue collection.

Proposed research question: To what extent is effective usage of RCM IT impacted by personnel's' commitment level to RCM performance, and to what extent does training, IT engagement, and an organizational culture of openness to innovation impact this link?

6.3. Process

Many different processes that range from monitoring self-performance and hiring practices to technology-adoption patterns and implementation sequences directly and indirectly impact RCM. Both research streams provide some insights into the processes impacting RCM, but the practitioner literature focuses on descriptive case stories and the small body of academic literature mostly looks at processes through the prism of variance studies without actually examining how they unfold in the field. One of the most important process impacting RCM that the practitioner literature frequently addresses without generating a proportional interest in academic research is the problem of

identifying appropriate RCM IT solutions. RCM software is a fast-growing but fragmented subsector of the HIT industry that comprises dozens of vendors who compete for a slice of the five billion pie (Black Book Rankings, 2013). Some vendors provide solutions to the different stages of the process, while others, more ambitiously, attempt to standardize and unify it in its entirety. Some cater to small rural hospitals and clinics while others to large urban hospitals. The sheer amount of IT options might make the heads of even the most tech-savvy decision makers spin. Although hospital leaders might intuitively believe that IT is the answer to their RCM needs, they lack sound theory and empirical evidence to guide their decision making. As a result, they might be tempted to blindly follow industry trends without having a good sense whether their choices give competitive advantage to their organization in the long run. Our examination of the process of selecting IT in the context of RCM in hospitals is theoretically important and practically needed. Table 9 summarizes key process propositions we derive from the literature and presents our suggested research question.

Table 9. RCM Process Propositions

Proposition 1:	Effective IT adoption and implantation impacts hospitals' RCM performance.
Proposition 2:	Effective approaches to IT adoption and implementation depend on the IT solution's type and nature and the targeted RCM activities.
Claim:	What IT solutions hospitals select for RCM impacts their financial performance.

Proposed research question: How can hospital leaders improve the efficacy of selecting, acquiring, and implementing IT to improve RCM?

6.4. Content

Our literature review reveals a big gap in academic knowledge on RCM's nooks and crannies. Almost all papers examining scheduling schemes are heavy on mathematics and light on real-world application. Most papers discussing documentation's importance for financial performance are anecdotal and descriptive. Due to its dependency on timely and accurate information flow inside the process, between various hospital employees, outside the process, and between the back office and third party payers, RCM increasingly requires ever-more effective IT support to oil its operations. Our review demonstrates that this fact is definitely not lost on the practitioners in the field but that academic research doesn't really address it. The nexus between IT, RCM activities, and hospitals' financial performance can prove a fertile ground for future research into administrative HIT. One can study each activity its own, but, to achieve true theoretical insights and practical applications, we advise researchers to periodically zoom out and examine how the different stages and technologies relate to each other. In Table 10, we provide seven separate propositions and a general research question that one can apply across the activities.

Table 10. RCM Content Propositions	
Proposition 1:	Effective, IT-enabled patient scheduling reduces waste in healthcare by reducing no-shows.
Proposition 2:	Effective, IT enabled, patient registration improves RCM performance by reducing demographic documentation errors and increasing compliance with third party set conditions.
Proposition 3:	Comprehensive documentation systems improve RCM performance by reducing variability in billing for items and services.
Proposition 4:	Effective IT-enabled coding improves RCM performance by reducing errors and increasing speed.
Proposition 5:	Automating billing-office functions improves RCM performance by reducing errors and increasing speed.
Proposition 6:	Effective IT-enabled payment posting improves RCM performance by speeding cash flow.
Proposition 7:	Effective IT-enabled late revenue recovery improves RCM performance by allowing hospitals to collect portions of revenue they would otherwise write-off.
Claim:	Effectively using IT can enhance all RCM activities
Proposed research question: How can hospital leaders leverage IT to enhance the performance of the different RCM activities?	

7. Limitations

Due to the fragmented state of RCM research, we found it challenging setting clear boundaries for selecting academic papers. Therefore, we chose an inclusive strategy that might have included research papers into the sample than some would find questionable. For the same reason, we adopted a contextualist perspective to emphasize a broad view and to focus on process rather than variance thinking. An inclusive perspective seems appropriate at this stage of developing an RCM agenda in HIT research. Obviously, as such research develops, we will need new and complementary approaches that can add new insights.

8. Conclusion

Hospital RCM operates in a pluralistic environment that is likely to grow even more complex as the regulatory landscape changes and the population ages. From contextually analyzing the academic literature and comparing its themes to themes emerging from practitioner discourse, we found a rich range of opportunities for future HIT research. Whereas the practitioner literature zooms in on specific issues related to IT-enabled RCM without sufficiently considering the complex contextual issues involved, the academic literature appears to be unfocused and disengaged. Although both literature streams emphasize the importance of technology in RCM, practitioners differentiate between administrative and clinical IT in the context of RCM, whereas the academic literature lags behind and rarely makes this differentiation.

IT-enabled RCM is essential for providing better and more affordable healthcare. We hope our sharing insights into the academic and practitioner literature and our outlining themes and theories for future research will stimulate further research to broaden current engagement in clinical HIT to include the use of HIT for business administration purposes. Given RCM's information-intensive nature and the complex, networked context in which RCM plays out, we are confident such engagement would lead to significant advances in knowledge while, at the same time, afford HIT researchers new opportunities to contribute significantly to society.

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Swindle, J. (2006). Good documentation: What it means for your physicians—and your revenue cycle. *Healthcare Financial Management*, *60*(9), 68-72
Tennyson, D. H., & Fottler, M. D. (2000). Does system membership enhance financial performance in hospitals? *Medical Care Research & Review*, *57*(1), 29-50.
Thiry, D., Evans, M., Walter, L., & Ramanathan, S. (2011). Success under reform through revenue cycle excellence. *Healthcare Financial Management*,*65*(5), 92-98.
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Appendices

Appendix A: Contextually Coded Academic Papers Sample

To identify relevant papers for this review, we systematically searched through three different search engines: Ebscohost Complete, Web of Science, and Google Scholar. Consistent with our contextualist approach, we employed multiple search words: "revenue cycle", "hospital revenue cycle", "hospital financial performance", "hospital information systems", "hospital profitability", "hospital administration", "hospital administration AND financial performance", "hospital scheduling", "healthcare scheduling", "hospital registration", "healthcare registration", "hospital documentation", "electronic medical records AND financial performance", "hospital clinical coding", "documentation AND coding", "hospital claim processing", "hospital revenue recovery", "hospital accounts receivable", "hospital information technology", "hospital governance AND financial performance", "hospital competition AND financial performance". Our selection criteria was inclusive, but we did choose not to include papers that address healthcare finance outside the context of the U.S. healthcare sector. We also limited our sample to the past 30 years to include papers that carry relevancy to the current landscape of U.S. healthcare. First, we identified a total of 2115 papers. After removing non-academic papers, we had 1244 papers. We reduced the sample to 133 after removing papers that did not sufficiently address financial performance. After removal of duplicates, we were left with a total of 96 papers. We subtracted overly technical papers and remained with a core sample of 88. Following Webster and Watson's (2002) recommendations for literature reviews, we added 29 papers we identified from examining key papers' references. The final sample stabilized on 107 papers (see Table A-1 for them all).

Table A-1. Reviewed Academic Papers

	Citation	Coding	IT
A1	Adams, D. L., Norman, H., & Burroughs, V. J. (2002). Addressing medical coding and billing part II: A strategy for achieving compliance a risk management approach for reducing coding and billing errors. *Journal of the National Medical Association, 94*(6), 430-447.	Content (clinical, documentation, medical charge coding, billing)	*
A2	Agarwal, R., Sands, D., & Schneider, J. (2010). Quantifying the economic impact of communication inefficiencies in U.S. hospitals. *Journal of Healthcare Management / American College of Healthcare Executives*, *55*(4), 265-281.	Inner context	
A3	Alaeddini, A., Yang, K., Reddy, C., & Yu, S. (2011). A probabilistic model for predicting the probability of no-show in hospital appointments. *Health Care Management Science*, 14(2), 146-157	Content (patient scheduling)	
A4	Alexander, J. A., & LEE, S. Y. D. (2006). Does governance matter? Board configuration and performance in not-for-profit hospitals. *Milbank Quarterly*, *84*(4), 733-758.	Inner context	
A5	Alexander, J. A., Weiner, B. J., & Griffith, J. (2006). Quality improvement and hospital financial performance. *Journal of Organizational Behavior*, *27*(7), 1003-1029.	Inner context	
A6	Anderson, G. (2007). From "soak the rich" to "soak the poor": Recent trends in hospital pricing. *Health Affairs*, *26*(3), 780-789.	Content (billing)	
A7	Angst, C. M., Devaraj, S., Queenan, C. C., & Greenwood, B. (2011). Performance Effects Related to the Sequence of Integration of Healthcare Technologies. *Production & Operations Management*, *20*(3), 319-333.	Process (variance study)	*
A8	Ballentine, N. H. (2009). Coding and documentation: Medicare severity diagnosis-related groups and present-on-admission documentation. *Journal of Hospital Medicine*, *4*(2), 124-130.	Content (medical charge coding, billing)	
A9	Bazzoli, G. J., Chan, B., Shortell, S. M., & D'Aunno, T. (2000). The financial performance of hospitals belonging to health networks and systems. *Inquiry*, *37*(3), 234-252.	Outer context	
A10	Berenson, R. A., Bodenheimer, T., & Pham, H. H. (2006). Specialty-service lines: Salvos in the new medical arms race. *Health Affairs*, *25*(5), w337-w343.	Outer context	

Table A-1. Reviewed Academic Papers (cont.)

	Citation	Coding	IT
A11	Blanchfield, B. B., Heffernan, J. L., Osgood, B., Sheehan, R. R., & Meyer, G. S. (2010). Saving billions of dollars—and physicians' time—by streamlining billing practices. *Health Affairs*, *29*(6), 1248-1254.	Content (billing)	*
A12	Boston-Fleischhauer, C. (2008). Enhancing healthcare process design with human factors engineering and reliability science, part 2: applying the knowledge to clinical documentation systems. *Journal of Nursing Administration*, *38*(2), 84-89.	Content (clinical documentation)	
A13	Breslow, M. J., Rosenfeld, B. A., Doerfler, M., Burke, G., Yates, G., Stone, D. J & Plocher, D. W. (2004). Effect of a multiple-site intensive care unit telemedicine program on clinical and economic outcomes: an alternative paradigm for intensivist staffing. *Critical Care Medicine*, *32*(1), 31-38.	Process (process study)	*
A14	Burns, L. R., & Pauly, M. V. (2002). Integrated delivery networks: a detour on the road to integrated health care? *Health Affairs*, *21*(4), 128-143.	Outer context	
A15	Cayirli, T., Veral, E., & Rosen, H. (2006). Designing appointment scheduling systems for ambulatory care services. *Health Care Management Science*, *9*(1), 47-58.	Content (patient scheduling)	
A16	Cebul, R., Rebitzer, J., Laylor, L., & Votruba, M. (2008). Organizational fragmentation and care quality in the U.S. healthcare system. *Journal of Economic Perspectives*, *22*(4), 93.	Outer context	
A17	Chadwick, C., Hunter, L. W., & Walston, S. L. (2004). Effects of downsizing practices on the performance of hospitals. *Strategic Management Journal*, *25*(5), 405-427.	Process (variance study)	
A18	Chakraborty, S., Muthuraman, K., & Lawley, M. (2013). Sequential clinical scheduling with patient no-show: The impact of pre-defined slot structures. *Socio-Economic Planning Sciences*,	Content (patient scheduling)	
A19	Cimasi, R., Sharamitaro, A. P., Haynes, L. A., & Seiler, R. L. (2008). Market impact of specialty hospitals: A study of the profitability of general short-term acute care hospitals post market entry of specialty hospitals. *Journal of Health Care Finance*, *35*(2), 1-53.	Outer context	
A20	Clement, J. P., McCue, M. J., Luke, R. D., Bramble, J. D., Rossiter, L. F., Ozcan, Y. A., & Pai, C. W. (1997). Strategic hospital alliances: Impact on financial performance. *Health Affairs*, *16*(6), 193-203.	Outer context	
A21	Conforti, D., Guerriero, F., Guido, R., Cerinic, M., & Conforti, M. (2011). An optimal decision making model for supporting week hospital management. *Health Care Management Science*, *14*(1), 74-88.	Content (patient scheduling)	
A22	Daggy, J., Lawley, M., Willis, D., Thayer, D., Suelzer, C., DeLaurentis, P. C., & Sands, L. (2010). Using no-show modeling to improve clinic performance. *Health Informatics Journal*, *16*(4), 246-259.	Content (patient scheduling)	
A23	Danvers, K., & Nikolov, P. (2010). Does outsourcing affect hospital profitability? *Journal of Health Care Finance*, *37*(1), 13-29.	Outer context	
A24	Devaraj, S., & Kohli, R. (2000). Information technology payoff in the health-care industry: A longitudinal study. *Journal of Management Information Systems*, *16*(4), 41-67.	Inner context	*
A25	Devaraj, S., & Kohli, R. (2003). Performance impacts of information technology: Is actual usage the missing link? *Management Science*, *49*(3), 273-289.	Inner context	*
A26	Devaraj, S., & Kohli, R. (2004). Contribution of institutional DSS to organizational performance: evidence from a longitudinal study. *Decision Support Systems*, *37*(1), 103-118.	Inner context	*
A27	Devaraj, S., Ow, T. T., & Kohli, R. (2013). Examining the impact of information technology and patient flow on healthcare performance: A theory of swift and even flow (TSEF) perspective. *Journal of Operations Management*, *31*(4), 181-192	Inner context	*
A28	Dexter, F., & Traub, R. D. (2002). How to schedule elective surgical cases into specific operating rooms to maximize the efficiency of use of operating room time. *Anesthesia & Analgesia*, *94*(4), 933-942.	Content (patient scheduling)	

Table A-1. Reviewed Academic Papers (cont.)

	Citation	Coding	IT
A29	Dexter, F., Macario, A., Traub, R., Hopwood, M., & Lubarsky, D. (1999). An operating room scheduling strategy to maximize the use of operating room block time: Computer simulation of patient scheduling and survey of patients' preferences for surgical waiting time. *Anesthesia and Analgesia*, *89*(1), 7-20.	Content (patient scheduling)	
A30	Douglas, T. J., & Ryman, J. A. (2003). Understanding competitive advantage in the general hospital industry: Evaluating strategic competencies. *Strategic Management Journal*, *24*(4), 333-347.	Outer context	
A31	Dranove, D., Shanley, M., & White, W. D. (1993). Price and concentration in hospital markets: the switch from patient-driven to payer-driven competition. *Journal of Law and Economics*, *36*(1), 179-204.	Outer context	
A32	Eldenburg, L., & Krishnan, R. (2003). Public versus private governance: a study of incentives and operational performance. *Journal of Accounting and Economics*, *35*(3), 377-404.	Outer context	
A33	Elsbach, K. D., Sutton, R. I., & Principe, K. E. (1998). Averting expected challenges through anticipatory impression management: A study of hospital billing. *Organization Science*, *9*(1), 68-86.	Content (billing)	
A34	Everhart, D., Neff, D., Al-Amin, M., Nogle, J., & Weech-Maldonado, R. (2013). The effects of nurse staffing on hospital financial performance: Competitive versus less competitive markets. *Health Care Management Review*, *38*(2), 146-155.	Inner context	
A35	Freeman, V. G., Rathore, S. S., Weinfurt, K. P., Schulman, K. A., & Sulmasy, D. P. (1999). Lying for patients: physician deception of third-party payers. *Archives of Internal Medicine*, *159*(19), 2263.	Content (billing)	
A36	Friedman, B., & Shortell, S. (1988). The financial performance of selected investor-owned and not-for-profit system hospitals before and after Medicare prospective payment. *Health Services Research*, *23*(2), 237.	Outer context	
A37	Friedman, B., Sood, N., Engstrom, K., & McKenzie, D. (2004). New evidence on hospital profitability by payer group and the effects of payer generosity. *International Journal of Health Care Finance and Economics*, *4*(3), 231-246.	Outer context	
A38	Gilmer, T., O'Connor, P., Sperl-Hillen, J., Rush, W., Johnson, P., Amundson, G., & ... Ekstrom, H. (2012). Cost-effectiveness of an electronic medical record based clinical decision support system. *Health Services Research*, *47*(6), 2137-2158.	Content (clinical documentation)	*
A39	Goes, J. B., & Zhan, C. (1995). The effects of hospital-physician integration strategies on hospital financial performance. *Health Services Research*, *30*(4), 507.	Inner context	
A40	Green, L. V., & Savin, S. (2008). Reducing delays for medical appointments: A queueing approach. *Operations Research*, *56*(6), 1526-1538.	Content (patient scheduling)	
A41	Gruber, J., & Rodriguez, D. (2007). How much uncompensated care do doctors provide? *Journal of Health Economics*, *26*(6), 1151-1169.	Content (revenue recovery)	
A42	Gupta, D., & Denton, B. (2008). Appointment scheduling in health care: Challenges and opportunities. *IIE Transactions*,*40*(9), 800-819	Content (patient scheduling)	
A43	Gupta, D., & Lei, W. (2008). Revenue Management for a Primary-Care Clinic in the Presence of Patient Choice. *Operations Research*, *56*(3), 576-592	Content (patient scheduling)	
A44	Hicks, T., & Gentleman, C. (2003). Improving physician documentation through a clinical documentation management program. *Nursing Administration Quarterly*, *27*(4), 285-289.	Content (clinical documentation)	
A45	Huang, Y. L., Zuniga, P., & Marcak, J. (2013). A cost-effective urgent care policy to improve patient access in a dynamic scheduled clinic setting. *Journal of the Operational Research Society*.	Content (patient scheduling)	
A46	Huang, Y., & Zuniga, P. (2011). Dynamic overbooking scheduling system to improve patient access. *Journal of the Operational Research Society*, 63(6), 810-820.	Content (patient scheduling)	

Table A-1. Reviewed Academic Papers (cont.)

	Citation	Coding	IT
A47	Hultman, C. I. (1991). Uncompensated care before and after prospective payment: the role of hospital location and ownership. *Health Services Research*, *26*(5), 613.	Outer context	
A48	Irwin, J. G., Hoffman, J. J., & Lamont, B. T. (1998). The effect of the acquisition of technological innovations on organizational performance: A resource-based view. *Journal of Engineering and Technology Management*, *15*(1), 25-54.	Process (variance study)	*
A49	Johnson, P. (2008). Pharmaceutical reimbursement: an overview. *American Journal of Health-System Pharmacy: AJHP: Official Journal of The American Society of Health-System Pharmacists*, *65*(2), S4-S10.	Content (billing)	
A50	Jordan, W. (2001). An early view of the impact of deregulation and managed care on hospital profitability and net worth. *Journal of Healthcare Management*, *46*(3), 161-171.	Outer context	
A51	Kaissi, A. A., Begun, J. W., & Welson, T. (2008). Strategic planning processes and hospital financial performance. *Journal of Healthcare Management*, *53*(3), 197.	Inner context	
A52	Kim, S., & Giachetti, R. E. (2006). A Stochastic Mathematical Appointment Overbooking Model for Healthcare Providers to Improve Profits. *IEEE Transactions On Systems, Man & Cybernetics: Part A, 36*(6), 1211-1219.	Content (patient scheduling)	
A53	Kohli, R., & Kettinger, W. J. (2004). Informating the clan: Controlling physicians' costs and outcomes. *MIS Quarterly*, *28*(3), 363-394.	Process (process study)	
A54	LaGanga, L. R., & Lawrence, S. R. (2007). Clinic overbooking to improve patient access and increase provider productivity*. *Decision Sciences*, *38*(2), 251-276.	Content (patient scheduling)	
A55	Leone, A., & Van Horn, R. (2005). How do nonprofit hospitals manage earnings? *Journal of Health Economics*, *24*(4), 815-837.	Content (entire RCM)	
A56	Li, P., Schneider, J. E., & Ward, M. M. (2009). Converting to critical access status: how does it affect rural hospitals' financial performance? *Inquiry*, *46*(1), 46-57.	Outer context	
A57	Lin, J., Muthuraman, K., & Lawley, M. (2011). Optimal and approximate algorithms for sequential clinical scheduling with no-shows. *IIE Transactions on Healthcare Systems Engineering*, *1*(1), 20-36.	Content (patient scheduling)	
A58	Luo, J., Kulkarni, V. G., & Ziya, S. (2012). Appointment scheduling under patient no-shows and service interruptions. *Manufacturing & Service Operations Managemen*t, *14*(4), 670-684.	Content (patient scheduling)	
A59	Manley, R., & Satiani, B. (2009). Revenue cycle management. *Journal of Vascular Surgery*, 50(5), 1232-1238.	Content (entire RCM)	
A60	Mark, T. L., Evans, W. N., Schur, C. L., & Guterman, S. (1998). Hospital-physician arrangements and hospital financial performance. *Medical Care,* 36(1), 67-78.	Process (variance study)	
A61	McCue, M. I., & Diana, M. L. (2007). Assessing the Performance of Freestanding Hospitals. *Journal of Healthcare Management*, *52*(5), 299-308.	Outer and inner context	
A62	McCue, M., Mark, B. A., & Harless, D. W. (2003). Nurse staffing, quality, and financial performance. *Journal of Health Care Finance*, *29*(4), 54-76.	Inner context	
A63	McDermott, D. R., Franzak, F. J., & Little, M. W. (1993). Does marketing relate to hospital profitability? *Journal of Health Care Marketing*, *13*(2), 18.	Outer context	
A64	Melnick, G. A., & Fonkych, K. (2008). Hospital pricing and the uninsured: Do the uninsured pay higher prices? *Health Affairs*, *27*(1/2), w116-w122.	Content (revenue recovery)	
A65	Menachemi, N., Burkhardt, J., Shewchuk, R., Burke, D., & Brooks, R. (2006). Hospital information technology and positive financial performance: A different approach to finding an ROI. *Journal of Healthcare Management / American College of Healthcare Executives*, *51*(1), 40-58.	Process (variance study)	*
A66	Menachemi, N., Burkhardt, J., Shewchuk, R., Burke, D., & Brooks, R. G. (2007). To outsource or not to outsource: Examining the effects of outsourcing IT functions on financial performance in hospitals. *Health Care Management Review*, *32*(1), 46-54.	Process (variance study)	*

Table A-1. Reviewed Academic Papers (cont.)

	Citation	Coding	IT
A67	Menon, N. M., Yaylacicegi, U., & Cezar, A. (2009). Differential Effects of the Two Types of Information Systems: A Hospital-Based Study. *Journal of Management Information Systems*, *26*(1), 297-316.	Inner context	*
A68	Miller, R. H., & Sim, I. (2004). Physicians' use of electronic medical records: barriers and solutions. *Health Affairs*, *23*(2), 116-126.	Content (clinical documentation)	
A69	Moczygemba, J., & Fenton, S. H. (2012). Lessons learned from an ICD-10-CM clinical documentation pilot study. *Perspectives in Health Information Management.* Retrieved from http://perspectives.ahima.org/lessons-learned-from-an-icd-10-cm-clinical-documentation-pilot-study/#.VlJBu3YrKUk	Inner context	*
A70	Molinari, C., Alexander, J., Morlock, L., & Lyles, C. A. (1995). Does the hospital board need a doctor? The influence of physician board participation on hospital financial performance. *Medical Care*, *33*(2), 170-185.	Inner context	
A71	Molinari, C., Morlock, L., Alexander, J., & Lyles, C. A. (1993). Hospital board effectiveness: Relationships between governing board composition and hospital financial viability. *Health Services Research*, *28*(3), 358.	Inner context	
A72	Moore, C. G., Wilson-Witherspoon, P., & Probst, J. C. (2001). Time and money: Effects of no-shows at a family practice residency clinic. *Family Medicine*, *33*(7), 522-527.	Content (patient scheduling)	
A73	Muthuraman, K., & Lawley, M. (2008). A stochastic overbooking model for outpatient clinical scheduling with no-shows. *IIE Transactions*, *40*(9), 820-837.	Content (patient scheduling)	
A74	Nauenberg, E., Brewer, C. S., Basu, K., Bliss, M. K., & Osborne, J. W. (1999). Network structure and hospital financial performance in New York State: 1991-1995. *Medical Care Research and Review*, *56*(4), 415-439.	Outer context	
A75	O'Malley, K. J., Cook, K. F., Price, M. D., Wildes, K., Hurdle, J. F., & Ashton, C. M. (2005). Measuring diagnoses: ICD code accuracy. *Health Services Research*, *40*(5P2), 1620-1639.	Content (medical charge coding)	
A76	Patrick, J. (2012). A Markov decision model for determining optimal outpatient scheduling. *Health Care Management Science*, 15(2), 91-102.	Content (patient scheduling)	
A77	Patrick, J., Puterman, M. L., & Queyranne, M. (2008). Dynamic multipriority patient scheduling for a diagnostic resource. *Operations Research*, *56*(6), 1507-1525.	Content (patient scheduling)	
A78	Pizzini, M. J. (2006). The relation between cost-system design, managers' evaluations of the relevance and usefulness of cost data, and financial performance: An empirical study of US hospitals. *Accounting, Organizations & Society*, *31*(2), 179-210	Inner context	*
A79	Powell, A., Savin, S., & Savva, N. (2012). Physician workload and hospital reimbursement: Overworked physicians generate less revenue per patient. *Manufacturing & Service Operations Management*, *14*(4), 512-528.	Inner context	
A80	Qu, X., Rardin, R. L., Williams, J. A. S., & Willis, D. R. (2007). Matching daily healthcare provider capacity to demand in advanced access scheduling systems. *European Journal of Operational Research*, *183*(2), 812-826.	Content (patient scheduling)	
A81	Quan, H., Li, B., Duncan Saunders, L., Parsons, G. A., Nilsson, C. I., Alibhai, A., & Ghali, W. A. (2008). Assessing validity of ICD-9-CM and ICD-10 administrative data in recording clinical conditions in a unique dually coded database. *Health Services Research*, *43*(4), 1424-1441.	Content (medical charge coding)	
A82	Rauscher, S., & Wheeler, J. (2012). Hospital financial management: What is the link between revenue cycle management, profitability, and not-for-profit hospitals' ability to grow equity? *Journal of Healthcare Management / American College of Healthcare Executives*, *57*(5), 325-339.	Content (generally related to RCM)	
A83	Rauscher, S., & Wheeler, J. C. (2008). Effective hospital revenue cycle management: Is there a trade-off between the amount of patient revenue and the speed of revenue collection? *Journal of Healthcare Management*, *53*(6), 392-405.	Content (revenue recovery)	

Table A-1. Reviewed Academic Papers (cont.)

	Citation	Coding	IT
A84	Rauscher, S., & Wheeler, J. C. (2010). Hospital revenue cycle management and payer mix: Do Medicare and medicaid undermine hospitals' ability to generate and collect patient care revenue? *Journal of Health Care Finance*, *37*(2), 81-96.	Outer context	
A85	Reinhardt, U. E. (2006). The pricing of US hospital services: Chaos behind a veil of secrecy. *Health Affairs*, *25*(1), 57-69.	Outer context	
A86	Reiter, K. L., Sandoval, G. A., Brown, A. D., & Pink, G. H. (2009). CEO compensation and hospital financial performance. *Medical Care Research and Review*, *66*(6), 725-738.	Outer context	
A87	Robinson, J. (2011). Hospitals respond to Medicare payment shortfalls by both shifting costs and cutting them, based on market concentration. *Health Affairs*, *30*(7), 1265-1271.	Outer context	
A88	Rosko, M., & Mutter, R. (2010). Inefficiency differences between critical access hospitals and prospectively paid rural hospitals. *Journal of Health Politics, Policy and Law*, *35*(1), 95-126	Outer context	
A89	Rundall, T., Oberlin, S., Thygesen, B., & Janus, K. (2012). Success under duress: Policies and practices managers view as keys to profitability in five California hospitals with challenging payer mix. *Journal of Healthcare Management / American College of Healthcare Executives*, *57*(2), 94-111.	Inner context	
A90	Schmitz, R. (1999). Building global billing and payment systems. *Managed Care Quarterly*, *7*(1), 16-28	Content (billing)	
A91	Setia, P., Setia, M., Krishnan, R., & Sambamurthy, V. (2011). The effects of the assimilation and use of IT applications on financial performance in healthcare organizations. *Journal of the Association for Information Systems*, *12*(3), 274-298.	Inner context	*
A92	Smith, A. L., Bradley, R. V., Bichescu, B. C., & Tremblay, M. (2013). IT governance characteristics, electronic medical records sophistication, and financial performance in U.S. hospitals: An empirical investigation. *Decision Sciences*, *44*(3), 483-516.	Content (clinical documentation)	
A93	Soremekun, O., Noble, V., Liteplo, A., Brown, D., & Zane, R. (2009). Financial impact of emergency department ultrasound. *Academic Emergency Medicine,16*(7), 674-680.	Process (process study)	*
A94	Spaulding, T. J., Furukawa, M. F., Raghu, T. S., & Vinze, A. (2013). Event sequence modeling of IT adoption in healthcare. *Decision Support Systems,* 55, 428-437.	Inner context	*
A95	Spring, S. F., Sandberg, W. S., Anupama, S., Walsh, J. L., Driscoll, W. D., & Raines, D. E. (2007). Automated documentation error detection and notification improves anesthesia billing performance. *Anesthesiology*, *106*(1), 157-163.	Content (clinical documentation and billing)	
A96	Tennyson, D. H., & Fottler, M. D. (2000). Does system membership enhance financial performance in hospitals? *Medical Care Research & Review*, *57*(1), 29.	Outer context (generally related to RCM)	
A97	Thorpe, K. E., Seiber, E. E., & Florence, C. S. (2001). The impact of HMOs on hospital-based uncompensated care. *Journal of Health Politics, Policy and Law*, *26*(3), 543-556.	Outer context	
A98	Van Horn, R., Burns, L., & Wholey, D. (1997). The impact of physician involvement in managed care on efficient use of hospital resources. *Medical Care*, 35(9), 873-889.	Inner context	
A99	Vélez-González, H., Pradhan, R., & Weech-Maldonado, R. (2011). The role of non-financial performance measures in predicting hospital financial performance: The case of for-profit system hospitals. *Journal of Health Care Finance*, *38*(2), 12-23.	Inner context	
A100	Wang, S. J., Middleton, B., Prosser, L. A., Bardon, C. G., Spurr, C. D., Carchidi, P. J., & Bates, D. W. (2003). A cost-benefit analysis of electronic medical records in primary care. *American Journal of Medicine*, *114*(5), 397-403.	Content (clinical documentation)	*
A101	Welton, J. M., Fischer, M. H., DeGrace, S., & Zone-Smith, L. (2006). Hospital nursing costs, billing, and reimbursement. *Nursing Economics*, *24*(5), 239.	Content (billing)	

Table A-1. Reviewed Academic Papers (cont.)

	Citation	Coding	IT
A102	White, C., & Wu, V. (2014). How do hospitals cope with sustained slow growth in Medicare prices? *Health Services Research*, *49*(1), 11-31	Outer context	
A103	Wilcox-Gök, V. (2002). The effects of for-profit status and system membership on the financial performance of hospitals. *Applied Economics*, *34*(4), 479-489.	Outer context	
A104	Wrenn, B., Latour, S. A., & Calder, B. J. (1994). Differences in perceptions of hospital marketing orientation between administrators and marketing officers. *Hospital & Health Services Administration*, 39(3), 341.	Outer context	
A105	Wurster, C., Lichtenstein, B., & Hogeboom, T. (2009). Strategic, political, and cultural aspects of IT implementation: Improving the efficacy of an IT system in a large hospital. *Journal of Healthcare Management*, *54*(3), 191-206.	Inner context	*
A106	Yu-Chu, S., Wu, V. Y., & Melnick, G. (2010). Trends in hospital cost and revenue, 1994–2005: How are they related to HMO penetration, concentration, and for-profit ownership? *Health Services Research*, 45(1), 42-61	Outer context	
A107	Zwanziger, J., Khan, N., & Bamezai, A. (2010). The relationship between safety net activities and hospital financial performance. *BMC Health Services Research*, *10*(15), 1-12.	Inner context	

Appendix B: Leximancer Analysis

Leximancer is text mining software that one can use analyze the content of multiple documents to reveal the major themes and concepts in them. It uses two separate non-linear algorithms for extracting semantic and relational information and presents this information as a conceptual map. To use Leximancer, one first needs to collect and pre-sort the documents to analyze. We used academic databases and their filters to narrow down our literature sample. We split the literature into eight different groups (outer context, inner context, process, and content papers) for both the academic and practitioner literature. We created eight corresponding "projects" on the Leximancer dashboard and uploaded the corresponding pre-sorted documents to each project.

After the documents are properly uploaded into projects, the Leximancer dashboard displays four options: "load data", "generate concept seeds", "generate thesaurus", and "run project". After loading the data, we ran the project without tempering with the concept seeds to get the "raw" map of concepts and themes. The initial map shows multiple relationships among themes and concepts in a form of "bubbles" and "links". On the right part of the screen, Leximancer provides a ranked list of words according to count and relevance. It also provides a window showing quotes from the text related to the concepts and themes. One can expand this window and further examine it. The initial map is busy with concepts and typically contains "extra" terms that are not necessarily relevant for one's research purpose.

To reduce the clutter, we used the "generate concepts seeds" function. The function allows one to select core concepts and suppress peripheral concepts. Removing concepts depends on the researchers' familiarity with the material and their common sense. For instance, the concept "percentage" frequently emerged as many papers provide statistical data in percentages; however, it has no value in showing thematic relationships in most cases, and, thus, we safely removed it. Generally, we avoided removing concepts as much as we could. After re-running the analysis, the emerging output is easier to interpret.

To understand how key concepts relate to each other on the map, we used the software's "path analysis" function, which allows one to pair concepts with one another. Leximancer then shows whether the concepts are directly related or, as in most cases, what other concepts come in between them and in what order. In this way, we identified how different key concepts relate to each other. Depending on the complexity of the map (each one is different), we performed between 15 to 30 path analyses on each of the eight maps. Most paths were consistent with our findings. In the manuscript, we report the main paths we did not identify in our initial review.

A short manual for how to make sense of Leximancer analysis can be found at http://secondyearexperience.ljmu.ac.uk/wp-content/uploads/2012/03/lexitemplate77.pdf.

A more comprehensive guide to the software can be found at http://static1.squarespace.com/static/539bebd7e4b045b6dc97e4f7/t/53c33e0fe4b056735b9b4683/1405304335237/Leximancer+Manual+Version+4.pdf.

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