INDICATORS OF FINANCIAL SOLVENCY IN U.S. HOSPITALS AND HEALTH SYSTEMS: A SYSTEMATIC REVIEW OF THE LITERATURE

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Abstract
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The purpose of this information synthesis is to systematically and critically review the financial, market, and operational indicators of solvency in U.S. hospitals and health systems. The cash flow theory, resource dependency theory, and organizational-environmental theory provide the underlying theoretical frameworks for the identification of the solvency indicators. Solvency articles are subjected to the Peter Goldschmidt and Judith Garrard methodologies for completing a systematic review of the literature. Fourteen empirical studies constitute the body of literature on this topic, and these studies are assessed, summarized, and presented in a literature review matrix.

The findings from this information synthesis identify a cumulative list of over 80 statistically significant solvency indicators. The statistically significant financial indicators that are validated by more than one empirical study are: Altman's Z-score, cash flow margin, days cash on hand, and debt per bed. The statistically significant market indicator that is validated by more than one study is: Medicare/Medicaid payer mix. The statistically significant operational indicators that are validated by more than one study are: age of plant, occupancy rate, average

length of stay, number of beds, and ownership type (for-profit or not for-profit). These ten indicators provide a starting point for a thorough solvency analysis.

The complexity of hospital solvency in terms of the number and mix of solvency indicators is demonstrated in this review. It is recommended that hospital managers utilize metrics from each of the three categories of indicators: financial, market, and operational, to enhance the likelihood of correctly identifying the warning signs of insolvency. Possible directions for future research include comparative studies on the validity and reliability of the indicators, as well as studies that identify the extent to which a given indicator is able to predict insolvency. Finally, this systematic review of the literature concludes that by continually tracking these ten metrics, managers can monitor the early warning signs of financial difficulties, identify areas of financial, market, and operational weakness, and identify and implement the necessary corrective action to avoid financial disaster.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER ONE

INTRODUCTION AND SIGNIFICANCE

This research consists of a review of the literature on the indicators of financial insolvency in U.S. hospitals and health systems. In this thesis, solvency indictors are divided into three categories: financial, market, and operational. See the 'Operational Definitions of Indicators' section in Chapter Three (Methods) for the definitions of these three categories. This review represents an application of Peter Goldschmidt's methodology for completing an information synthesis (Goldschmidt, 1986). Chapter One provides an introduction to the project, identification of the problem statement, and significance of the problem statement. Chapter Two provides background information on the problem and corresponding theoretical frameworks. Chapter Three includes a review of the methods used. Chapter Four presents the results of the literature review and an analysis of the findings. Chapter Five provides some concluding thoughts on the limitations, managerial implications, and policy implications of the findings.

Introduction of the Project

Health care is a dynamic and continually evolving industry. Recent reform efforts and changes in the provision of health care services in the U.S. affect the ways in which health care is organized, delivered, and financed. Broyles, Brandt, and Biard-Holmes (1998) characterize these changes as "dramatic changes" that "threaten the fiscal viability and financial status of hospitals" (Broyles, Brandt, & Biard-Holmes, 1998, p. 327). The dramatic changes that Broyles, et al. (1998) refer to, are changes initiated by reform efforts within the past couple of decades. These efforts include the Balanced Budget Act of 1997, the rise and fall of managed care, the

development of the Prospective Payment System, and the recent trend toward pay for performance. All of these changes have an impact on hospital reimbursements, which are directly tied to the financial viability of the organization. Two examples of changes to reimbursements include: 1) private payers using leverage to negotiate lower reimbursement rates, and 2) federal and state-funded programs basing reimbursements on quality and outcome measurements (Langabeer, 2007). These changes suggest that it is imperative for hospital administrators and board members to regularly monitor the financial position of their organization in order to identify the warning signs of financial failure. But what are the warning signs of financial failure, and what should hospital administrators and board members look for?

A number of theoretical frameworks and financial distress models are used in health care to help management assess hospital financial performance. Three of these theoretical frameworks are discussed in Chapter Two (Background) along with two important models (The Altman Z-score and Cleverley's Financial Strength Index). Most hospital administrators presently rely upon internal financial and operational reports (Langabeer, 2006). Internal information is used to gauge hospital performance compared to performance in prior years, or compared to key benchmarks. Often this approach utilizes key performance indicators (KPIs), defined as "financial and operating metrics that measure performance critical to the success of the organization" (Gapenski, 2007, p. 587), and financial heuristics, defined as "general guidelines, or rules of thumb that serve to simplify decision-making under uncertainty" (Langabeer, 2007, p. 81). The literature, however, states that these measures fall short of the predictive power and reliable assessment sought by managers (Price, Cameron, & Price, 2005, Boblitz, 2006). Price, et al. (2005) state there are several examples of corporations that have failed despite accrual-based financial ratios indicating no major problems. In addition, Boblitz

(2006) notes that "financial measures are lag indicators that report on the outcomes from past actions" (Boblitz, 2006, p. 47). The mere presence of a body of literature indicating the inaccuracy of this approach, as well as the desire to accurately foresee hospital failures, invites a review of what the literature states are the true indicators of hospital financial failures.

Currently, no comprehensive information synthesis on the indicators of hospital financial solvency exists. The majority of the studies identified for this information synthesis contain minimal review of the literature on this topic. Thus, this report seeks to contribute to the body of knowledge on hospital solvency by synthesizing the findings from multiple empirical studies. Morey, Scherzer, and Varshney (2003) define financial insolvency as negative equity, or the point where the "fair market value of an organization's assets are less than [its] liabilities" (Morey, Scherzer, & Varshney, 2003, p. 93). Indeed, insolvency is the point where the owner's equity is less than zero, or where the value of the firm is a negative value.

Problem Statement

The problem statement examined here is: What are the indicators of financial solvency in U.S. hospitals and health systems? Included in the analysis of this question, are additional questions such as: Which indicators are cited in the literature? How valid are the indicators? Are there groups or combinations of valid indicators of solvency? Is it useful for hospital leaders to analyze indicators from all three categories of financial, market, and operational?

Significance of the Problem Statement

The ability to assess a hospital's true financial performance, and thus, the ability to determine when an organization is on the verge of bankruptcy, is a beneficial tool for hospital

administrators. The timely detection of financial distress is important if hospital executives are to take corrective action and prevent further degradation of the hospital's financial health (Price, Cameron, & Price, 2005). Identifying and regularly monitoring financial solvency indicators allows hospitals to take a preventive approach to managing the hospital's operations and financial health. Identification of the warning signs of financial insolvency is a proactive rather than a reactive approach that has the potential to save an organization from bankruptcy. Price, et al. (2005) state that appropriate monitoring can literally "avert a crisis" (Price, Cameron, & Price, 2005, p. 74).

One of the challenges of developing a model for the detection of insolvency is the identification of an indicator, or set of indicators, that is both accurate and practical. Many other industries have developed financial distress models, however, many of these are cumbersome and may not necessarily maintain their predictive power across industries (Lynn & Wertheim, 1993). Thus, the development of accurate and practical indicators specific to U.S. hospitals and health systems is a potentially powerful tool for hospital leaders.

CHAPTER TWO

BACKGROUND

This chapter analyzes the underlying theoretical frameworks of hospital performance that currently serve as a resource for hospital executives. Three of the most frequently referenced theories in the solvency literature are cash flow theory, resource dependency theory, and organizational-environmental theory. Cash flow theory, along with two financial distress models (Altman's Z-score and Cleverley's Financial Strength Index), provide the necessary background information for the analysis of financial solvency indicators. The resource dependency theory and the organizational-environmental theory provide a foundation for the analysis of the market and operational solvency indicators. These three theories collectively provide the theoretical frameworks necessary for the assessment of hospital and hospital system fiscal performance.

Cash Flow Theory

One of the contributing theoretical frameworks for analysis of solvency in U.S. hospitals and health systems is Cash Flow Theory. Also known as Free Cash Flow Theory or the Pecking Order Theory, this theory states that organizations will use their liquid reserves, such as cash and marketable securities, prior to relying on debt or equity (Frank & Goyal, 2002). The Cash Flow Theory is in opposition to the optimal debt/equity financing theory that is less applicable in today's poor economy. The optimal debt/equity financing theory states that a firm should strive to maintain the capital structure that optimizes the firm's value. Hospitals and health systems today have an incentive to take on less than the 'optimal' amount of debt, and therefore place greater reliance on their internal reserves (Kim & McCue, 2008). This is largely due to the high correlation between leverage and risk, which includes the risk of bankruptcy (Jensen, 1986).

Sometimes organizations are forced to take out bridge loans to fund operations until an expected cash flow stream records from the sale of an asset.

The application of Cash Flow Theory is not standardized across different types of health care organizations. Cleverley and Baserman (2005) find that cash flow theory is more applicable to voluntary health systems than it is to investor-owned systems (IOs). Their findings suggest that voluntary health systems rely more heavily upon cash and other liquid reserves when replacing capital. IOs are more likely to rely upon their ability to raise new equity funds (Cleverley & Baserman, 2005). This is mostly explained by the lack of access to equity capital for non-profit hospitals, and therefore their reliance upon liquid reserves and tax-exempt bonds to finance new capital investments (Cleverley & Baserman, 2005). An excellent example of how this theory applies to solvency analysis in the health care industry is presented in Kim and McCue's (2008) study. This study evaluates hospital performance according to a hospital's capital investment decisions (Kim & McCue, 2008). There is a positive feedback loop between cash flow, hospital financial solvency, and capital investments actions (Kim & McCue, 2008). Increases in cash flow allow for increased capital investment actions and enhanced solvency, and new capital investments often increase cash flow and thus secure hospital solvency.

In summary, this theory underscores the importance of cash flow and cash flow ratios in sustaining and measuring hospital and hospital system solvency. The importance of cash flow metrics is further evidenced by their presence in the following two common financial distress models. Both the Altman Z-score and Cleverley's Financial Strength Index models include a liquidity measure that attempts to accurately identify the warning signs of financial failure.

Altman Z-score

In 1968, New York University professor Edward Altman developed the Altman Z-score, basing his study on thirty-three matched pairs of bankrupt and solvent firms. The model is developed from a multiple discriminate analysis, and is based on information contained in a firm's income statement and balance sheet. The Altman Z-score model is similar to a balanced financial scorecard that calculates an index score for each firm based on five variables (Altman, 1968). The resultant equation is as follows:

$$Z = 0.012X_1 + 0.014X_2 + 0.33X_3 + 0.006X_4 + 0.99X_5$$

where X_1 = working capital/total assets; X_2 = retained earnings/total assets; X_3 = EBIT/total assets; X_4 = market value of equity/book value of total debt; and X_5 = sales/total assets. The resultant Z-score is then used as an indicator for the financial position of the hospital. Altman concludes that a Z-score of less than 1.1 indicates an organization where bankruptcy is imminent, a score between 1.1 and 2.6 indicates a "gray zone", and a score greater than 2.6 indicates good financial position (Price, Cameron, & Price, 2005). Altman's model is able to predict a company's bankruptcy position with a 93.5% success rate one year prior to bankruptcy. The success rate two years prior to bankruptcy is still high at 72%. While Altman's original study does not include an analysis of hospitals, the Altman Z-score is currently used to analyze U.S. hospitals and health systems. The Altman Z-score is used in the Langabeer (2006), and Langabeer (2007) studies in this report.

The main limitation of Altman's prediction model is that it is based on financial data gathered from a small number of manufacturing firms. A study by Grice and Ingram (2001) found that the Altman Z-score is less useful for predicting bankruptcy in non-manufacturing

industries than it is in manufacturing industries. This study also found that the Altman Z-score is not as useful for predicting bankruptcy in recent periods as it was in the period in which it was developed. One positive finding from the Grice and Ingram (2001) study is its conclusion that the model is useful for predicting financial stress conditions other than bankruptcy. In summary, the Altman Z-score is not a perfect predictor of financial insolvency in U.S. hospitals and health systems, yet it has the potential to provide useful information on a hospital's true fiscal performance.

Cleverley's Financial Strength Index

The Financial Strength Index (FSI) is the product of work done by William Cleverley. Unlike the Altman Z-score, the FSI is designed specifically for hospitals, so application to the health care industry is not an issue with this indicator. The FSI is a composite measure of four dimensions that, according to Cleverley, collectively determine a hospital's financial health. These four dimensions are: profitability, liquidity, financial leverage, and age of physical facilities. The FSI equation is:

$$\text{FSI} = ([\text{total margin} - 4.0]/4.0) + ([\text{days cash on hand} - 50]/50) + ([50 - \text{debt financing \%}]/50) + ([9.0 - \text{average age of plant}]/9.0.$$

Cleverley provides a relatively straightforward interpretation of the FSI stating, "the FSI implies that firms with large profits, great liquidity, low levels of debt, and new physical facilities are in excellent financial condition" (Cleverley, 2002, p. 46). An FSI of -2.0 to 0.0 indicates fair financial health, a score of 0.0 to 3.0 indicates a firm has average financial health, and an index score greater than 3.0 is indicative of excellent financial health (Price, Cameron, & Price, 2005). The numerical values in the equation demonstrate that this model is "normalized" around a

predefined average. Lynn and Wertheim (1993) state that the measure "has yet to be adequately validated" (Lynn & Wertheim, 1993, p. 66). Price, Cameron, and Price (2005) add that the FSI "provides an excellent starting point for analyzing a hospital's condition" (Price, Cameron, & Price, 2005, p. 75). As with most indicators, the FSI is not without limitations. It is limited in its standardized application to all hospitals and health systems because different types of health care organizations have different financing patterns and structures (Coyne, 1985, Cleverley & Baserman, 2005). Despite its limitations, Cleverley's FSI is used in the literature on the indicators of financial solvency, specifically in the Price, et al. (2005), Cleverley (2002), and Lynn and Wertheim (1993) articles used in this report.

Together, Cleverley's FSI, Altman's Z-score, and the supporting Cash Flow Theory are a prominent contributor to the underlying theoretical framework for the study of solvency in U.S. hospitals and health systems.

Resource Dependency Theory

Resource Dependency Theory (RDT) is another theoretical framework present in the hospital performance body of literature. Jeffery Pfeffer is credited with the development of this theory in the late 1970s. This theory is an externally focused economic theory that began outside of the health care industry. The premise of RDT is that an organization's viability is dependent upon its ability to secure resources from its environment. Resources are defined broadly, but in the health care industry, resources are defined as patients, physicians, or plant (Kim & McCue, 2008). Organizations that can obtain resources from the environment experience greater organizational power and enhanced viability (Mudambi & Pedersen, 2007). Concepts such as diversification, bargaining power, and market share play significant roles in this theory, and

under RDT, more diversified hospitals and health systems possess relatively more bargaining power and more market share. These factors give them a decreased likelihood of insolvency. Kim and McCue (2008) use RDT as one of the theoretical frameworks for their study on hospital capital investments. They state that hospitals functioning in a resource-rich environment are more likely to prosper and realize solvency.

Resource Dependency Theory also has implications for hospitals and hospital system strategic planning. Often, an organization's solvency is dependent upon its ability to participate in acquisitions, joint ventures, and the formation of limited partnerships with other organizations in its environment. McCue and Diana (2007) found that when hospitals approach insolvency, they take the necessary steps to secure the needed resources from their environment. One of these steps is to form joint ventures and partnerships, or to acquire other hospitals and/or health systems.

According to Mudambi and Pedersen (2007), the main limitation of the Resource Dependency Theory is that it has not undergone extensive empirical testing. However, despite this limitation, some of the limited empirical testing completed on this theory is done in the health care sector (Mudambi & Pedersen, 2007).

In summary, the Resource Dependency Theory states that a hospital's viability and solvency are dependent upon the resource-richness of the environment and the hospital's ability to tap into these resources.

Organizational-Environmental Theory

The Organizational-Environmental Theory is also an externally focused management theory. Thompson and McEwen (1958) are credited with the development of this theory, which analyzes an organization's response to its environment, and attempts to explain why some organizations respond more actively when faced with drastic economic or social changes (Burgess, 1976). Thompson and McEwen (1958) found that an organization's process of setting goals to ensure viability is an "interaction process between organizations and environmental factors" (Burgess, 1976, p. 292). Leifer and Delbecq (1978) add that an organization's operational and financial performance is dependent upon its ability to obtain information about changes outside of its organizational boundaries (Leifer & Delbecq, 1978). Under this definition, "organizational boundaries" are defined as, "lines or demarcations between one system and another, that protects members of the organization from extra systemic influences, and regulates the flow of information, material, and people into or out of the system" (Leifer & Delbecq, 1978, p. 41). Leifer and Delbecq (1978) add that the permeability of organizational boundaries is indicative of the organization's internal conditions, where increased permeability implies unstable internal conditions (Leifer & Delbecq, 1978). Burgess (1978) adds that an organization's ability to adapt to its environment lies on a passive-active continuum.

While not stated explicitly, Griffith and Alexander (2002) utilize and apply the Organizational-Environmental Theory to the health care sector in their article on measuring comparative hospital performance. Their findings suggest that hospital performance is dependent upon a hospital's ability to acquire information about competitors and benchmarks,

and then to apply this information in the development of a strategic plan (Griffith & Alexander, 2002).

In summary, according to the Organizational-Environmental Theory, an organization's viability is dependent upon its ability to interact with its environment and develop sustainable relationships with other organizations under uncertain conditions. This is particularly true in the health care sector given its dynamic nature. From a health care and hospital perspective, successful interaction includes building strong relationships with vendors, suppliers, contract workers, the community, and the like. Discussed in Chapter Four (Results/Analysis) is a review of articles indicating the importance of this theory and an organization's strategic position on the creation of a solvent organization.

Conclusion about the Background

The information on these two financial distress models and three theoretical frameworks provide a background for the findings of the articles reviewed in this information synthesis. None of these theories alone are indicative of insolvency, but when looked at collectively, the theories and models provide a necessary foundation for analyzing the research question presented in this report. Currently, there is not a universal metric that is successfully applied in the health care industry. This is evident in the literature. Nearly every study utilizes more than one metric as early warning signs of insolvency. The aim of this study is to summarize and present the findings from fourteen hospital solvency articles, and to draw conclusions on the statistically significant solvency variables that are routinely identified and confirmed by the literature.

CHAPTER THREE

METHODS

This research utilizes Peter Goldschmidt's methodology for conducting a systematic information synthesis. The articles used in this information synthesis are retrieved from Washington State University online databases, namely EBSCO, PubMed, and Medline. This chapter includes: 1) a review of the Goldschmidt information synthesis methodology, search inclusion/exclusion criteria, search terms and time frame of searches, operational definitions of the three categories of indicators, 2) a review of Judith Garrard's methodology for utilizing a literature review matrix, and 3) a summary of how this study will use these methodologies.

Information Synthesis Methodology

Peter Goldschmidt's (1986) practical guide for conducting an information synthesis is used as the methodological framework for the findings of this report. This methodology is divided into the following four actions 1) define the topic, 2) search for information, 3) assess the validity of the information, and 4) present the valid information in a useful way. The end product is a synthesis of a body of information on the defined topic. Goldschmidt's methodology recognizes the importance of a sharp focus on the specific problem or question, systematic searches for information, a useful/practical presentation of the findings, and identification of informational gaps in the literature. Goldschmidt advises the researcher to identify the inclusion/exclusion criteria, the search terms used, the time frame of searches, and the target audience in order to assist in clearly defining the topic. Two potential sources for an information synthesis are the literature and expert testimony. Assessing the validity of the information is both relative and judgmental, and Goldschmidt recommends that articles are

evaluated based on the methods used and the generalizability of the findings (Goldschmidt, 1986). Goldschmidt does not prescribe a particular methodology for presenting results. Rather he states that the method of presentation depends on the topic and the target audience. Judith Garrard's literature review matrix is used to present the findings.

Inclusion/Exclusion Criteria

Goldschmidt (1986) describes the importance of clearly stating how information is identified and assessed. The process of defining relevant information begins with a clear description of the inclusion/exclusion criteria used. The primary inclusion criterion in this report is empirical studies from 1983 to 2008 that identify indicators of financial solvency in U.S. hospitals and health systems. Studies identifying otherwise relevant information prior to 1983 are excluded, as are relevant articles identifying otherwise relevant information on countries outside of the U.S. A logical explanation is that these criteria capture the bulk of the literature on this topic because the indicators in a universal health care system are conceptually different than the indicators in the U.S. health care system. Similarly, the indicators prior to 1983 are conceptually different than current indicators, given the change to reimbursement under the Prospective Payment System in 1983. All types of hospitals and health systems are included for review. In other words, a study is not excluded based on its analysis of rural vs. urban hospitals, teaching vs. non-teaching hospitals, for-profit vs. non-profit status, and the like. In addition, articles are included if they contain information on any type of solvency indicator. Therefore, studies looking at financial indicators, market indicators, and operational indicators are all included for review. Finally, articles that identify insignificant measures of financial solvency in U.S. hospitals and health systems are also included. The justification for this inclusion criterion

is the belief that identification of false measures is useful for identifying the true solvency indicators.

Search Terms, Time Frame, and Target Audience

Searches for articles were performed between November 2008 and March 2009. Searches utilize the EBSCO, Medline, and PubMed online databases from Washington State University. Articles are limited to articles published in peer-reviewed journals only. The key search terms are "hospital solvency", "hospital" and "cash flow", "cash liquidity", "cash management", "hospital" and "return on equity", "insolvency" and "predictors", "insolvency" and "indicators", "hospital" and "financial" and "distress." Also, additional articles from the reference list of studies generated from the search terms above are included. A total of fourteen articles are included in the final review of the literature and production of the information synthesis. Of these fourteen articles, twelve analyze the effectiveness of at least one financial indicator, seven address at least one market indicator, and nine investigate at least one operational indicator. In total, these fourteen articles are selected from over 320 articles generated by searches.

The target audience for this information synthesis is hospital and hospital system administrators. In addition, the information presented is valuable for board members and community leaders, and for students and faculty in health administration and other healthcare-related programs.

One method of drawing conclusions about the findings of multiple empirical studies is to perform a vote count of the statistically significant findings (Cooper, 1989). This method is used in the more rigorous meta-analysis study design, and while this is study is not a meta-analysis,

the vote count methodology is adopted in order to draw conclusions from the hospital solvency literature. This study represents preliminary research on the collective analysis of hospital solvency, and two studies validating the statistical significance of a particular indicator is used as the cut-off point in this study.

Operational Definitions of Indicators

Operational definitions are important for understanding the constructs of interest, as well as for clearly defining how the solvency literature is organized in this literature review. The insolvency indicators identified in the literature are grouped into three categories according to Gapenski: financial indicators, market indicators, and operational indicators (Gapenski, 2006). The following discussion will define the characteristics of the indicators that place them in one of these three categories.

An indicator is classified as a financial indicator if one or more financial ratio(s) were used to analyze hospital performance. Financial ratio analysis is defined as, "the process of creating and analyzing ratios from the data contained in a business's financial statements to help assess financial condition" (Gapenski, 2006, p. 691). Financial indicators are the most common category of solvency indicator used in the literature. Examples of liquidity ratios are the current ratio, days cash on hand, net days revenue in accounts receivable, and cash flow margin (Pink, et al. 2006, Griffith, et al. 2002, Langabeer, 2007, Coyne & Singh, 2008). Other financial indicators are related to profitability and include ratios such as total margin and return on equity (Pink, et al. 2006), Cleverley's Financial Strength Index, and the Altman Z-score (Price, et al. 2005). Asset utilization and leverage ratios are also used and include ratios such as asset turnover and total liabilities to total assets (Lynn & Wertheim, 1993).

The second category of solvency indicators reviewed in the literature is market indicators. Indicators are classified as market indicators if they measure external changes in the environment, or market, within which the hospital or hospital system resides. Market indicators include indicators such as the number of beds available in the market, the number of physicians, and the extent of managed care penetration (Kim & McCue, 2007). Other indicators that are classified as market indicators are service area growth rates, service line growth rates, and market share (Boblitz, 2006). Changes in the unemployment rate and per capita income are also relevant market indicators that may affect the solvency of a hospital (McCue, 2007).

Operational indicators are the third category of indicators used in the literature to foretell hospital insolvency. In contrast to market indicators, which are externally based, operational indicators are internally based. Examples of operational indicators are salary and benefit expense as a percentage of operating expenses, occupancy rate, operating expense per adjusted discharge (McCue, 2007), and average length of stay (Griffith & Alexander, 2002).

Literature Review Matrix

The Goldschmidt methodology provides an excellent framework for completing an information synthesis. However, Goldschmidt does not prescribe an exact methodology for presenting the findings from the literature searches. Rather, the Goldschmidt methodology allows the author to select the method that he/she finds most useful for presenting the findings in a clear and concise manner.

Judith Garrard provides a methodology for succinctly presenting the findings from literature searches. The literature review matrix provides a clear and organized presentation of the findings. Utilization of this methodology allows the reader to easily identify the trends and

key findings. According to Garrard's methodology, journal articles are arranged chronologically by year of publication from oldest to most recent. Garrard's literature review matrix methodology prescribes that the first column contain the author(s), title of the article, and journal; column two is to contain the year of publication; column three is to contain the purpose of the journal article. Once the researcher has documented these three columns, Garrard leaves the remaining number of columns and titles of the columns open to the discretion of the researcher. It is up to the investigator to decide on the number and titles of the remaining columns so that he/she can synthesize the most relevant presentation of the topic information. Six additional columns were added to the literature review matrix in this report. These columns in sequential order are location/hospital/hospital system, study design, data set, results, strengths/weaknesses, and conclusions/recommendations (see the presentation of the literature in this literature review matrix in Appendix A).

This study uses both Peter Goldschmidt's methodology for conducting a systematic information synthesis, as well as Judith Garrard's methodology for utilizing a literature review matrix. Hence, the positive attributes of both of these literature review tools are necessary to complete a systematic review of the literature, and when combined, they yield a powerful presentation of the literature.

CHAPTER FOUR

RESULTS & ANALYSIS

Chapter Four (Results & Analysis) takes a comprehensive look at the articles generated according to the methodology in Chapter Three (Methods). This chapter is divided into four sections. The first three sections address the financial, market, and operational indicators used to assess individual hospital performance. The fourth section looks at the indicators utilized at the hospital system level. The information is presented in this way to accommodate the much larger body of literature that exists on individual hospital solvency compared to hospital system solvency.

Financial Indicators

Lynn and Wertheim's (1993) study attempts to predict insolvency using twenty-one financial ratios. Seventy-one non-profit hospitals that reached the point of insolvency in either 1986 or 1987 are matched with a sample of open hospitals during the same period of time. Lynn and Wertheim (1993) use financial statement information taken from the Health Care Financing Administration Annual (now Centers for Medicare and Medicaid) Medicare Hospital Cost Reports. This study finds that insolvent hospitals have higher leverage (debt), and lower liquidity, capital efficiency, and asset availability, both one and two years prior to closure. Significantly, Lynn and Wertheim find that the single most predictive variable one year prior to closure is net income to total revenues, which carries a predictive accuracy percentage of 69.2%. In addition, a multivariate model is built using one ratio from each of four categories (leverage, liquidity, capital efficiency, resource availability). The model with the highest predictive accuracy (75% one year prior to closure and 73.8% two years prior to closure) includes the

following four ratios: i) total liabilities/total assets (leverage), ii) total assets/current liabilities (liquidity), iii) total revenue/total expenses (capital efficiency), and iv) total assets/bed days available (resource availability). Lynn and Wertheim conclude that these findings are particularly strong considering that "the decision to close a not-for-profit hospital is often influenced by many nonfinancial considerations" (Lynn & Wertheim, 1993, p. 69). This study's main limitation is its comparison to standard industry norm metrics, which is warned against by researchers such as Langabeer (2007).

Griffith and Alexander (2002) include key financial indicators as one of their four dimensions for assessing comparative hospital performance. The Griffith and Alexander (2002) study utilizes data from Medicare cost reports and the American Hospital Association annual survey. It employs strong statistical analyses to assess the reliability, validity, and sensitivity of three financial ratios: cash flow margin, percent of revenue from outpatient care, and asset turnover. The findings assert that these three financial measures are reliable, valid, and sensitive measures of evaluating U.S. hospital performance. Two of the most significant limitations of this study are: 1) the lack of measures of quality, and 2) analytic techniques that include outliers up to six standard deviations from the mean. The norm is to include data lying within two standard deviations of the mean. This is because data lying beyond two standard deviations will likely skew the findings (Hoyle, Harris, & Judd, 2002).

Younis and Forgoine (2005) use return on equity (ROE) and total profit margin (TPM) to assess U.S. hospital performance. These researchers use a very large sample size of 3,000 hospitals and control for an exhaustive list of variables, which are two main strengths of this study. The purpose of the study is to determine which of the two metrics, ROE or TPM, is the

better measure of a hospital's true profitability. The findings propose that TPM is the better measure of profitability ($R^2 = 0.2598$ vs. $R^2 = 0.0312$, respectively). The main limitation of this study is the inconsistent methodology used to measure equity in each hospital. This significant limitation is the result of Younis and Forgoine's inclusion of both for-profit and non-profit hospitals. Non-profit hospitals have sources of equity from net income (including non-operating income) only, whereas for-profit hospitals attain equity from net income that is after a tax that is not applied to non-profits. Also, for-profit hospitals generate equity from stock sales. The well-intended purpose of this study is clouded by the inconsistent methodology used for measuring equity. Thus, this limitation is one possible explanation for why ROE is found as the inferior measure of hospital profitability.

In 2006, Langabeer relies upon the Altman Z-score to predict financial distress in teaching hospitals. In this study, hospitals are divided into two categories, low and high z-score hospitals. A number of financial metrics are calculated for each hospital and the statistically significant financial indicators that emerge are debt per bed, days of working capital, operating margin, and days cash on hand. Interestingly, Langabeer finds that "nearly one out of every six teaching hospitals sampled [is] predicted to be near immediate bankruptcy" (Langabeer, 2006, p. 84). The main limitation of this study is that it utilizes a highly correlated indicator to divide the hospitals into two groups. This introduces the problem of multicollinearity. The problem with multicollinearity is that indicators using similar financial statement line items as those used to calculate the Z-score may have an increased likelihood of yielding statistically significant results (Shi, 2008). Two of the four significant results in this study (debt per bed and operating margin) are in accord with the findings from previously discussed studies.

The Langabeer (2006) study warns against using benchmarks and standardized metrics to assess hospital solvency. This is a point Langabeer reiterates in his 2007 article on the fallacy of financial heuristics. Langabeer (2007) analyzes the financial strength of over 40 hospitals using 30 operational and financial indicators. His findings suggest that organizations require different cash-debt positions (which is consistent with his earlier point on the irrelevance of one-size fits all metrics), and the optimal level of free cash flow and debt should depend on the hospital's individual financial condition. Despite this conclusion, Langabeer (2007) offers five statistically significant financial indicators of hospital solvency: average operating margin, days of cash on hand, Z-score, debt per bed, and fund balance. This study is limited by its analysis of large, multi-specialty hospitals in a single state only.

In addition to revenue generating metrics, such as those analyzed in the Langabeer (2006), Langabeer (2007), Griffith and Alexander (2002), Younis and Forgoine (2005), and Lynn and Wertheim (1993) studies, Broyles, Brandt, and Baird-Holmes (1998) include metrics on expense control. This study, which analyzes 60 rural hospitals in the state of Oklahoma, utilizes two state-administered surveys. The study compares fiscal performance of freestanding rural hospitals and network-affiliated hospitals using five financial ratios. The findings suggest that net cash flow per service and the ability to control both labor and non-labor expenses are important indicators of rural hospital solvency. This study, with a main strength that lies in its inclusion of expense control metrics, is limited by its statewide (rather than nationwide) analysis, and its disregard for differences in case-mix index.

McCue and his colleagues identify key financial performance indicators in three separate empirical studies. First, McCue (2007) confirms the importance of expense control metrics with

his analysis of large, rural, for-profit hospitals with positive cash flows. According to this study, hospitals with positive cash flows have lower operating expenses per adjusted discharge and lower salary expense as a percentage of total operating expenses; significant at p=.01 level. One of the strengths of this article is its nationwide analysis, looking at Centers for Medicare and Medicaid Services (CMS) cost report data. A limitation of this study is its focus on a narrow group of hospitals, namely large, rural, for-profit hospitals with positive cash flows for three consecutive years.

A second study by McCue and Diana (2007) relies upon the Resource Dependency Theory to produce additional solvency indicators. This empirical study uses data from the American Hospital Association surveys and CMS cost report data to evaluate the performance of freestanding hospitals. The findings from this study are consistent with the findings from other studies evaluated in this section, which stress the importance of high profitability, high liquidity, and low leverage (Lynn & Wertheim, 1993, McCue & Diana, 2007). Specifically, the significant at p=.01 level financial indicators generated from this study are cash flow margin, cash and investments as a percentage of assets, and long-term debt to capital. This study utilizes a fairly large sample size (N=687) from a national data set, which enhances the generalizability of the findings. The main limitation of this study is the fact that it places hospitals in the comparison group (non-positive cash flow group) if the hospital did not generate a positive cash flow for even one of the three consecutive years under study. While this is a potentially insignificant limitation, stronger conclusions are potentially drawn from a comparison of hospitals with non-positive cash flows for all three years.

The most recent publication by McCue looks at the financial viability of hospitals based on their capital investment decisions (Kim & McCue, 2008). As stated in the discussion on Cash Flow Theory in Chapter Two (Background), capital investment decisions, positive cash flow, and enhanced solvency are all interrelated components of high-performing hospitals. The sample in this study is a panel of nonprofit hospitals operating between 1998 and 2001. Liquidity, or the availability of internal funds, is the most critical indicator of increased capital investment actions for the hospitals in this study. This empirical study is strengthened by its very large sample size (N=2,658), and its separate comparison of urban and rural hospitals. This study is limited by the extent to which indicators of capital investment actions are also indicators of financial solvency. In summary, McCue's research contributes additional indicators of interest and verifies the importance of the liquidity and cash flow metrics.

Market Indicators

The analysis now turns to market indicators. This category of indicators is an important category beyond the financial measures used for the detection of insolvency in U.S. hospitals. "Exclusive reliance on financial indicators could promote behavior that sacrifices long-term value creation for short-term performance" (Boblitz, 2006, p. 47). Market indicators are the least prevalent category of indicators in the literature. However, this category still produces a useful body of information for hospital executives. Seven of the fourteen articles used in this report analyze one or more market indicators. The significant findings from these empirical studies are presented in this section.

Succi, Lee, and Alexander (1997) assess the effects of market position and environmental competition on rural hospital closures. This longitudinal study utilizes four data sources to

analyze a variety of market indicators. The large sample size (N=2,780) and analysis at the national-level offer strengths. However, the number of competing and non-competing hospitals in the area are only approximations. The principal findings from this study are that less differentiated rural hospitals, existing in more competitive markets, are at an increased risk of closure. Thus differentiation and level of competition (including market density) in the hospital's market are two important market solvency indicators. Further, the extent to which the hospital is differentiated from its competitors is the better predictor of rural hospital closure, where differentiation is accomplished via geographic differentiation, service line differentiation, and/or high-tech service differentiation.

McCue and Diana (2007) find a positive correlation between hospital market share and positive cash flows in freestanding hospitals. In addition, McCue and Diana (2007) consider the number of physicians per capita and number of beds per capita in the market and find both of these factors to influence the fiscal performance of hospitals. Further, the study finds that the Medicare and Medicaid payer mix of the market also has a significant effect on hospital performance. Hospitals located in markets with lower Medicare HMO penetration rates are associated with higher cash flows; hospitals serving a lower percent of Medicaid patients are associated with higher cash flows. Other market variables that are considered in this study were the per capita income and the unemployment rate, both of which are insignificant indicators of financial solvency.

The Broyles, Brandt, and Biard-Holmes (1993) article confirms the finding from McCue and Diana (2007) on the insignificance of the market unemployment rate. While this indicator was insignificant in the Broyles, et al. (1993) study, the rural index, which is a measure of the

population size and distance from an urban area, is found to have a positive, statistically significant, influence on rural hospital cash flow.

McCue's (2007) empirical study looks at an array of market indicators, including the unemployment rate and per capita income metrics from the two previous studies. These two metrics are again found insignificant, in addition to the other metrics analyzed by McCue in this study: growth in population, growth in population over the age of 65, and market share. Further, the findings from this study suggest that positive cash flow hospitals offer more hospital services than lower cash flow hospitals, which is consistent with the diversification metric in the Succi, et al. (1997) study.

McCue and Diana (2007) found that the market payer mix has an effect on hospital solvency. The Selzer, Gomez, Jacobson, Wischmeyer, Sood, and Broadie's (2001) study on the financial survival of public hospital-based level 1 trauma centers also yields significant results related to payer mix. Selzer, et al. (2001) compare the profit and loss margins of hospitals with and without federal disproportionate share (DSH) funds. Disproportionate share funds are given to hospitals that care for a disproportionate share of indigent patients. These hospitals care for a large portion of uninsured, Medicaid, and other low-income patients. The findings from this study demonstrate that DSH funds are a vital component of the continued viability of public hospitals. The main limitation of this study is that it has a strong clinical focus, and it utilizes the patient (rather than the hospital) as the unit of analysis. The same or similar analyses at multiple level 1 trauma centers would greatly enhance the strength of this study.

Younis and Forgoine (2005) confirm the affect of disproportionate share on the total profit margin of U.S. hospitals. The disproportionate share ratio in this study is defined as the

number of indigent patient days to total hospital patient days. Their finding that a higher proportion of indigent patients yields lower hospital profit margins supports the findings from McCue and Diana (2007) and Selzer, et al. (2001). Other market indicators from this empirical study that are statistically significant are the hospital's geographic location (hospitals in the Northeast serve as the reference category) and whether the hospital is the sole Medicare provider in the area. Hospitals operating in the South are found to have significantly lower total profit margins. Hospitals serving as the sole Medicare provider in their area also have lower total profit margins.

Kim and McCue (2008) end this section on the market indicators of financial solvency in U.S. hospitals. This study analyzes a number of market indicators. The number of primary care physicians (PCPs) to total number of MDs, number of physicians per 1,000 population, population size, population over the age of 65, per capita income, unemployment rate, Hirshman-Herfindahl index, certificate of need (CON) stringency, percent of Medicaid discharges to total discharges, and extent of HMO penetration in the market are the collective list of market indicators examined in this study. Of this comprehensive list, four variables influence the capital investment actions and solvency of hospitals. A higher percentage of PCPs to all MDs in the area positively affects hospital solvency. Additionally, the unemployment rate, percentage of the population over the age of 65, and the extent of HMO penetration all have a significant, but negative association with hospital solvency. The statistically significant finding for the market unemployment rate in this study conflicts with the findings from other McCue studies.

Operational Indicators

The third and final category of indicators is operational indicators. This class of indicators focuses on factors related to hospital operations. Operational indicators are more likely under the direct control of management, so this section may contain more of a practical application component for hospital leaders seeking to prevent insolvency. The body of literature under review in this section contains information from twelve of the articles relied upon in this report.

Some of the most common operational indicators cited in the literature are ownership, number of beds, occupancy rate, number of services offered, number of FTEs, average age of plant, and average length of stay. Younis and Forgoine (2005) consider a number of these operational indicators in their empirical study on evaluating hospital performance. The operational indicators reviewed in this article include for-profit or non-profit ownership status, whether the hospital has converted from for-profit to non-profit or vice versa within the past two years, teaching hospital status, critical access hospital status, average length of inpatient stay, number of beds in service, number of full-time equivalent employees per 100 case-mix adjusted discharges, and percentage of occupied beds in service. Of these indicators, the number of full-time equivalent employees per 100 case-mix adjusted discharges has the most significant influence on the hospitals' financial performance. For-profit ownership status and teaching hospital status have a positive influence on hospital fiscal performance, and critical access status has a negative influence. Average length of stay adjusted for case-mix and occupancy both have a positive affect on hospital solvency. Conversion status and the number of beds are the only operational variables in this study that do not have a significant influence on hospital solvency.

Kim and McCue (2008) also consider the occupancy rate, case-mix index, average age of plant, and number of high-tech services offered by a given hospital. Age of plant is the only operational indicator that yields statistically significant results. Occupancy rate is not a statistically insignificant indicator in this study, which contrasts the findings from Younis and Forgoine (2005).

Langabeer (2006) contrasts Kim and McCue's (2008) findings on the significance of the average age of plant metric. In this study, Langabeer considers a number of operational indicators in his evaluation of the financial performance of teaching hospitals. His operational indicators include the number of outpatient visits, number of discharges, number of beds, reputation score (from the *U.S. News and World Report* rankings), average age of plant, and number of services offered. Of these six operational indicators, only the number of outpatient visits and the number of discharges are statistically significant indicators. However, in 2007, Langabeer finds the number of beds statistically significant in his evaluation of forty hospitals in New York State. Here, high-performing hospitals are found to have more beds than low-performing hospitals.

Broyles, Brandt, and Biard-Holmes (1998) add to the uncertainty surrounding the number of beds metric. Broyles, et al. (1998) study the fiscal performance of rural hospitals and analyze eight operational indicators: membership in a hospital network, number of staffed beds, number of admitting physicians to number of staffed beds, JCAHO certification, number of admissions per number of staffed beds, number of visits, percent of patient days public (Medicare or Medicaid reimbursement), and average length of stay. All operational indicators except for the number of admitting physicians per number of staffed beds have a statistically significant effect

on cash flow of the hospitals under study. Specifically, Broyles, et al. (1998) find an inverse relationship between average length of stay, percent days public, and number of staffed beds on cash flow in U.S. hospitals. This finding on the number of staffed beds contrasts Langabeer's (2007) finding which stated the reverse, that high performing hospitals have more staffed beds.

Two separate empirical studies by McCue in 2007 analyze operational indicators. Both studies look at occupancy rate, number of staffed beds, and number of services offered by the hospital. Of the operational indicators analyzed in McCue (2007), only the occupancy rate is identified as a statistically significant indicator of positive cash flow in rural hospitals. In addition to occupancy rate, number of services offered, and number of beds, McCue and Diana (2007) also include a metric for the number of full-time equivalents (FTEs) per census. Of these measures, only occupancy rate emerged as statistically significant.

Griffith and Alexander (2002) seek to test the reliability, content validity, and sensitivity of operational indicators in their study on measuring comparative hospital performance. Cost per case (operating expense per adjusted discharge), mortality index (two-year average of actual deaths divided by expected deaths), complication index (incidence of 43 negative clinical events), length of inpatient stay, occupancy, and change in occupancy rate were the operational variables of interest in this study. Of these, cost per case, mortality index, complication index, and length of inpatient stay are deemed reliable, valid, and sensitive measures of hospital performance. Griffith and Alexander (2002) state that these four indicators (in addition to the three financial metrics deemed reliable in the financial indicators section) create a balanced scorecard that both reflects the performance of hospitals and identifies areas of improvement. The two occupancy measures are not included in the balanced scorecard because they did not

yield statistically significant results. According to Griffith and Alexander (2002), the occupancy metrics are "suspect" measures (Griffith & Alexander, 2002, p. 48) that fail to reflect the shift to outpatient care.

Health Systems

The analysis now turns to the much smaller body of literature on solvency indicators for U.S. health systems. Health systems are composed of at least two hospitals and may also include affiliations with outpatient non-acute health care facilities. The relationship between the solvency indicators for individual hospitals and hospital systems is unknown. Specifically, the literature does not identify whether the solvency indicators for individual hospitals are vali d indicators for health systems. Two empirical articles serve as the basis for the analysis of this section, and two additional articles at the individual hospital level provide a transition from the discussion of individual hospital solvency to hospital system level solvency indicators.

Broyles, Brandt, and Baird-Holmes (1998) find benefits of individual hospital participation in a hospital network. According to this study, hospitals affiliated with a hospital system have lower operating, labor, and non-labor expenses per service, and as a result have higher net cash flow. McCue and Diana (2007) state that health systems are less "vulnerable to market and management risk factors that can influence their financial performance" (McCue & Diana, 2007, p. 300). In addition, there is a trend toward increasing hospital and hospital system integration via transactions such as mergers and acquisitions. Collectively, these factors seem to indicate that there are benefits of participation in a health system. But what are the warning signs of insolvency at this larger, system level if individual hospitals are sheltered by the benefit

of network participation? Unfortunately, the literature only provides a brief insight into a few of the financial indicators.

A recent article by Coyne and Singh (2008) finds key cash flow metrics up to five years prior to insolvency as indicative of financial failure. This empirical study compares seven financial ratios for thirteen insolvent and five solvent health systems. Three of the seven ratios (operating cash flow percentage change, operating cash flow to net revenues, and cash flow to total liabilities) are statistically significant financial indicators of insolvency in U.S. health systems. This study is limited by the availability of data, and missing data may provide for less powerful results. Also, the authors do not control for the ownership status of the health systems. As seen in the article by Cleverley and Baserman (2005), the patterns of financing for investor-owned and voluntary health systems are different. The health systems may have different methods of cash management, which could yield significant differences in the cash flow ratio analysis.

Cleverley and Baserman (2005) look at the patterns of financing for the largest investor-owned and voluntary health systems in the U.S. Underlying this analysis is the assumption that the largest health systems are also the most solvent. According to their findings, large health systems have greater degrees of financial leverage, greater access to capital (and therefore less capital leasing), and lower costs of financing when compared to freestanding hospitals. A limitation of this study is that it describes, rather than identifies, the key indicators of a hospital system's solvency.

The final article on solvency at the hospital system level is another study by Coyne. Coyne (1985) completes a comparative financial analysis of multi-institutional organizations by

ownership type. The key statistically significant financial indicators that emerge from this empirical study are cash liquidity, long-term debt to equity, and return on investment. Coyne (1985) states that cash liquidity is the "most sensitive measure of financial insolvency" because it indicates the number of days that a system is able to provide for its daily cash outflows (Coyne, 1985, p. 52). Leverage, measured via long-term debt to equity, and profitability measured via return on investment are also key ratios that Coyne advises health systems to monitor. One of the strengths of this article is its classification of health systems as investor-owned or non-profit. This classification eliminates the potentially confounding factor of differences related to patterns of financing. The main limitation of this study is its identification of solvency trends rather than specific solvency indicators.

Conclusion

In total, these fourteen empirical studies provide an analysis of over 160 different financial, market, and operational indicators of solvency. Of these 160 solvency indicators, about half were significant in one empirical study. The following four financial measures are statistically significant indicators that are validated by more than one empirical study: Altman's Z-score in 2 studies (Langabeer, 2006, Langabeer 2007), cash flow margin in 2 studies (Griffith & Alexander, 2002, McCue & Diana, 2007), days cash on hand in 2 studies (Langabeer, 2006, Langabeer 2007), and debt per bed in 2 studies (Langabeer, 2006, Langabeer 2007). The following market indicator is a statistically significant indicator that is validated by more than one empirical study: Medicare and/or Medicaid payer mix in 2 studies (McCue 2007, McCue & Diana, 2007). The following five operational indicators are statistically significant indicators that are validated by more than one empirical study: age of plant in 2 studies (Kim & McCue,

2008, McCue & Diana, 2007), occupancy rate in 3 studies (McCue 2007, McCue & Diana 2007, Younis & Forgoine, 2005), average length of stay in 2 studies (Broyles, Brandt, & Biard-Holmes, 1998, Younis & Forgoine, 2005), number of beds in 2 studies (Langabeer, 2007, Broyles, et al. 1998), and ownership type (for-profit or not for-profit) in 2 studies (Younis & Forgoine, 2005, Succi, et al., 1997). See Table 1. Statistically Significant Indicators Validated by More Than One Empirical Study below for the presentation of these results.

Table 1. Statistically Significant Indicators Validated by More Than One Empirical Study

Category of Indicators		Specific Indicator		Studies (Author, Year) Identifying Significance	Methodology	p-value
Financial	1	Altman z-score	1	Langabeer (2006)	Linear regression	0.05
			2	Langabeer (2007)	Regression analysis	0.05
	2	Cash flow margin	1	Griffith & Alexander (2002)	Least squares regression	0.01
			2	McCue & Diana (2007)	Logistic regression	0.01
	3	Days cash on hand	1	Langabeer (2006)	Linear regression	0.05
			2	Langabeer (2007)	Regression analysis	0.05
	4	Debt per bed	1	Langabeer (2006)	Linear regression	0.05
			2	Langabeer (2007)	Regression analysis	0.05
Market	5	Public payer mix	1	McCue (2007)	Logistic regression	0.01
			2	McCue & Diana (2007)	Logistic regression	0.05
Operational	6	Age of plant	1	Kim & McCue (2008)	Multivariate analysis	0.10
			2	McCue & Diana (2007)	Logistic regression	0.05
	7	Occupancy rate	1	McCue (2007)	Logistic regression	0.05
			2	McCue & Diana (2007)	Logistic regression	0.01
			3	Younis & Forgoine (2005)	Regression analysis	0.10
	8	Ave length of stay	1	Broyles, et al. (1998)	Regression analysis	0.10
			2	Younis & Forgoine (2005)	Regression analysis	0.10
	9	Number of beds	1	Langabeer (2007)	Regression analysis	0.05
			2	Broyles, et al. (1998)	Regression analysis	0.01
	10	Ownership type	1	Younis & Forgoine (2005)	Regression analysis	0.10
			2	Succi et al. (1997)	Logistic regression	0.01

The literature identifies only a limited number of financial solvency indicators at the health system level. Literature on market and operational indicators at the hospital system level were not found. The financial indicators identified as significant at the system level are also

significant at the individual hospital level. However, at this point, it is premature to assume that the reverse is true, or that the solvency indicators at the hospital level are also applicable at the hospital system level. This is because there is a large discrepancy in the number of empirical studies on solvency at the two different levels. The preliminary research seems to suggest that these indicators are similar.

CHAPTER FIVE

CONCLUSION

This report seeks to synthesize the key financial, market, and operational solvency indicators for U.S. hospitals and health systems. In the fourteen articles reviewed, many indicators are analyzed and many emerge as statistically significant. However, the patterns of significance are challenging to pinpoint, and only a small percentage of the total number of indicators surface as significant in more than one empirical study. The information presented in this chapter stems from the results and analysis provided in Chapter Four (Results & Analysis). Chapter Five (Conclusions) begins with responses to each of the research questions proposed in the Problem Statement section of Chapter One (Introduction). The responses to each of the research questions are according to what is known from this review of the literature, then follows with what is not known from the review, and finally, points out directions for future research. The last two sections of Chapter Five (Conclusions) discuss the managerial and policy implications of the findings.

<u>What are the indicators of financial solvency in U.S. hospitals and health systems?</u>

The fourteen empirical studies used in this information synthesis produce a cumulative list of 80 statistically significant solvency indicators for U.S. hospitals and health systems. However, only ten of these 80 indicators are validated as statistically significant by more than one empirical study. There are four statistically significant financial indicators that are validated by more than one empirical study: Altman's Z-score, cash flow margin, days cash on hand, and debt per bed. The statistically significant market indicator that is validated by more than one empirical study is: Medicare/Medicaid payer mix. Statistically significant operational indicators

that are validated by more than one solvency study are: age of plant, occupancy rate, average length of stay, number of beds, and ownership type (for-profit or not for-profit). Routine monitoring of these eight to ten indicators (number of beds and ownership type are not volatile metrics that require regular monitoring) by hospital administrators will help identify the warning signs insolvency.

While the literature does identify many statistically significant indicators, some shortcomings exist. For example, the literature fails to identify or discuss the possible interactive effects of indicators, or the extent to which indicators overlap and thereby measure the same component. For example, a hospital may have high levels of debt, which could yield statistical significance in both the cash flow to total debt metric and the long-term debt per bed metric. Thus, it is unclear whether these two metrics are capturing the same concern (e.g., amount of leverage), or different concerns (e.g., amount of leverage and hospital size). Possible directions for future research include systematic analyses of which indicator(s) explain the largest percent of the variance of hospital solvency. Methodological designs similar to that used by Younis and Forgoine (2005), which determines the better of two profitability measures, are one recommendation.

Which indicators are cited in the literature?

This review of the literature provides a large list of significant and insignificant financial, market, and operational solvency indicators. Appendix B of this analysis presents this cumulative list of indicators. Appendix B also identifies ambiguous indicators, or indicators for which no strong conclusions are drawn. These controversial indicators are indicators such as the

market share indicator, which one study finds significant (McCue & Diana, 2007) and one study finds insignificant (McCue, 2007).

The cumulative list does not provide the reader with information on whether this is the true, exhaustive list of indicators. Rather this list serves as a starting point for future analyses that can aid in the identification and analysis of additional indicators or combinations of indicators.

How valid are the indicators?

The inclusion criteria, namely the inclusion of empirical studies only, from a specific period of time, serve to enhance the validity of the indicators provided in the literature. In addition, the assessment of the methodological rigor and strengths and weaknesses of each empirical study serve as a mechanism for judging the validity of the indicators produced from that study. Further, if an indicator is confirmed as significant by multiple empirical studies, then the validity of that indicator is enhanced.

Beginning with Altman in 1968, researchers have attempted to produce an accurate and useful model for detecting the warning signs of bankruptcy. The literature, however, reinforces the notion that a true assessment of hospital solvency is much larger than a single ratio or prediction model (Price, Cameron, & Price, 2005, Langabeer 2006, Langabeer 2007). The importance of contextual analysis is emphasized (Price, Cameron, & Price, 2005), where an assessment of a hospital's performance should only begin with an analysis of key solvency indicators. The operational indicators are perhaps the most useful category of indicators for hospital managers seeking to preserve or enhance their hospital's solvency. This is because the indicators in this category are internally-based metrics that are more likely under the direct

control of management. For example, hospital managers have more control over the number of service offered (an operational indicator), versus the percentage of the population over the age of 65 (a market indicator).

Are there groups or combinations of valid indicators of solvency?

The Lynn and Wertheim (1993) study was the only one of the fourteen empirical studies reviewed in this synthesis that sought to find the single indicator with the most predictive power, as well as the single four ratio model with the most predictive power. Lynn and Wertheim's (1993) four ratio model includes the total liabilities/total assets, total assets/current liabilities, total revenue/total expenses, and total assets/bed days available ratios. The remaining literature has simply identified many solvency indicators. Therefore, more studies like that of Lynn and Wertheim (1993) would move the state of knowledge forward on this topic. To reiterate, studies that seek to identify the extent to which a given indicator explains the variability in hospital solvency is a suggested direction for future research.

The Altman Z-score is also a combination of five ratios, namely working capital/total assets, retained earnings/total assets, EBIT/total assets, market value of equity/book value of debt, and sales/total assets, that is utilized and found significant in the Langabeer (2006) and Langabeer (2007) studies. These two studies, which relied upon different data sets, verify that the Altman Z-score is a valid indicator of solvency in the health care industry. Both the Lynn and Wertheim model and the Altman Z-score, when used in combination with other statistically significant metrics, could provide for a powerful understanding of a hospital's solvency.

Is it useful for hospital leaders to analyze indicators from all three categories?

The answer to this question is a definite yes. The underlying theoretical frameworks confirm the importance of all three categories of solvency indicators. Each category of indicators serves to identify the warning signs of solvency in their own way, and at different points in time. For example, hospital insolvency may begin with changes in one or more market indicators. If the payer mix of the market changes significantly, then this may affect operational indicators such as the occupancy rate, which will affect financial ratios in the form of changes in reimbursements and revenues. A comprehensive and diligent analysis of a hospital's solvency includes statistically significant indicators from each of the three categories. This point is supported by the literature as researchers strive to attain what is often referred to as a 'balanced scorecard.' A balanced scorecard is defined as a fair "performance assessment tool" (Swayne, Duncan, & Ginter, 2006, p. 431) that presents a comprehensive view of the organization. Price, Cameron, and Price (2005), and Griffith and Alexander (2002) are two articles that emphasize the importance of the balanced scorecard approach. It "provides governance with a broader, more effective understanding of the issues" (Griffith & Alexander, 2002, p. 42).

What is unclear is what proportion of each category of indicators should make up a balanced scorecard. It is clear that the indicators should cover a broad basis, but what is the proportion of financial indicators needed in a balanced scorecard? How about the proportions of market and operational indicators? Again, these are questions and directions for future research.

Managerial Implications

There are a few managerial implications that are drawn from this solvency indicator analysis. First, and perhaps most importantly, managers must recognize the limitations of

individual metrics. As Langabeer (2007) suggests, there is not a one-size fits all metric that is applied equally to all types of hospitals. Financial heuristics provide a mechanism for managers to assess performance relative to benchmarks or industry averages. However, they are not standard metrics that each hospital should necessarily strive to meet. Indicators, whether financial, market, or operational, are best assessed within the context of the individual hospital. A large, solvent, for-profit hospital's ideal cash position (and therefore cash-based measures) may look very different from a small, solvent, critical access hospital's ideal cash position. This latter point leads to the second managerial implication, which is to monitor a hospital's solvency regularly. Routine monitoring of a hospital's situation using the ten key indicators identified in this literature review will allow for the timely detection of unfavorable trends. The more frequent and diligent the analysis, the more likely it is that hospital administrators, financial statement auditors, and board members will identify the warnings signs of financial failure (Cleverly, 2002).

Finally, contextually and individually evaluated indicators, monitored on a routine basis can serve as the foundation for the strategic planning activities of the organization. In particular, changes in key market and operational indicators can identify the ways in which hospitals can modify their strategic goals to capture additional market share, and to improve upon key indicators such as occupancy rate.

Policy Implications

A number of key policy implications are drawn from the results and analysis of this information synthesis. First, it is important to recognize that the solvency literature prior to the implementation of diagnostic-related groups (DRGs) under the Prospective Payment System

(PPS) is virtually non-existent. Hospital and health system insolvency was less prevalent under the previous cost-based method of reimbursement, which explains the lack of literature on this topic prior to 1983. Decreased reimbursements have lead to the need for diligent financial, market, and operational analyses, as well as the need for identification of the warning signs of financial failure. This first policy implication is a demonstration of the significant impact that changes in policy can have on hospital and health system solvency.

Second, the literature clearly demonstrates the impact that disproportionate share funds have on hospital solvency (Selzer, et al. 2000, Younis & Forgoine, 2005). Both of these studies, in addition to other studies identifying the significance of Medicare and Medicaid payer mix on hospital solvency (Broyles, et al. 1998, McCue, 2007, McCue & Diana, 2007), demonstrate the reliance that U.S. hospitals and health systems have on the nature of federal reimbursements. Policy makers should be alerted to the fact that decreases in reimbursements effect a hospital's bottom line and their ability to satisfy current obligations. Ultimately, decreases in reimbursements will affect the hospital labor force since salaries and wages are the largest expense item on a hospital's income statement. In turn, this could have an impact on the provision of care. In Spokane County, the increasing unemployment levels are associated with increased uncompensated care levels; during recent periods when admissions are increasing at Providence Health & Services, the local health system is looking to limit staffing to compensate for decreases in revenues (Stucke, 2009). This local example provides insight into some of the potential policy implications of reductions in reimbursements, in combination with increases in unemployment, even under conditions of increased occupancy.

Not only do reductions in reimbursements have an effect on hospital solvency, but the timing and nature of federal reimbursements also have a direct impact on hospital solvency. This study confirms the importance of cash-based measures such as the Altman Z-score, cash flow margin, and days cash on hand metrics, therefore delays in reimbursements will affect solvency via decreases in these ratios. The importance of distributing federal reimbursements in a timely manner is evidenced, and hospital Chief Financial Officers are encouraged to work with their fiscal intermediary to process payments for servicers rendered as efficiently as feasible.

Finally, the policy implications for critical access hospitals (CAHs) and rural hospitals are also considered. CAHs are the one exception to the prospective payment system. The fact that these hospitals, which are reimbursed at their cost plus one percent, continue to struggle with financial solvency, provides insight into the extent of the problems facing rural hospitals. However, despite financial problems, rural hospitals play a key role in the provision of health care in the U.S. About 22.5% of the U.S. population lives in rural areas, but only 13.2% of physicians practice in these areas (Robert Wood Johnson Foundation, 1997).

Policymakers may want to consider the following questions when drafting policies related to rural and critical access hospitals: Are CAHs an effective use of scarce health care resources? Will increasing reimbursements and/or other forms of federal funding to these hospitals increase the likelihood of solvency? If so, by how much will solvency increase? What are the costs and benefits of supporting or fixing the current system versus designing a new delivery system in rural areas?

In summary, ten statistically significant indicators, verified by more than one empirical study emerge as the primary indicators of financial solvency in U.S. hospitals and health

systems. These ten indicators are a compilation of metrics from the three categories of indicators, where four are financial, one is market, and five are operational. The ten statistically significant indicators validated by multiple empirical studies are indicative of some important patterns. For the financial category, cash flow appears to dominate as reflected in three of the four indicators: Altman Z-score, cash flow margin, and days cash on hand. For the market category, the proportion of public payers is clearly important as reflected by the Medicare/Medicaid payer mix indicator. For the operating indicators, basic descriptive measures about operations appear to dominate all five of these indicators, namely age of plant, occupancy rate, average length of stay, number of beds, and ownership type (for-profit or not for-profit).

This systematic review of empirical studies on hospital solvency encourages hospital administrators to use the ten metrics identified in this study to regularly monitor the position of their organization. Application of these metrics will assist hospital executives in moving through the current tough economic times. Use of the four financial measures will force hospital executives to return to the basics of their financial well-being and focus on cash-based measures, rather than just accrual-based metrics. Hospital executives should also be focused on the proportion of public payer patient mix and its impact on the hospital's overall financial health. Finally, senior leaders are encouraged to monitor their operations by examining the basic measures of occupancy and length of stay. Through continual tracking of these ten indicators, managers can identify the early warning signs of financial difficulties, identify areas of financial, market, and operational weakness, and identify and implement the necessary corrective actions to avoid insolvency.

REFERENCES

Altman, E. (1968). Financial ratios, discriminate analysis and the prediction of corporate bankruptcy. *Journal of Finance, 23,* 589-609.

Boblitz, M. (2006). Looking out the window market intelligence for a view of the real world. *Healthcare Financial Management, 60,* 46-53.

Broyles, R., Brandt, E., Biard-Holmes, D. (1998). Networks and the fiscal performance of rural hospitals in Oklahoma: Are they associated? *The Journal of Rural Health, 14,* 327-337.

Burgess, A. (1976). Organizational-environmental processes in response to threat. *Mass Emergencies, 1,* 291-302.

Cleverley, W. (2002). Who is responsible for business failures? *Healthcare Financial Management, 56,* 46-52.

Cleverley, W., & Baserman, S. (2005). Patterns of financing for the largest hospital systems in the United States. *Journal of Healthcare Management, 50,* 361-365.

Cooper, H. (1989). *Synthesizing research: A guide for literature reviews* (2nd ed.). Newbury Park, CA: Sage.

Coyne, J. (1985). A comparative financial analysis of multi-institutional organizations by ownership type. *Hospital & Health Services Administration, 30,* 48-63.

Coyne, J., & Singh, S. (2008). The early indicators of financial failure: A study of bankrupt and solvent health systems. *Journal of Healthcare Management, 5,* 333-346.

Frank, M., & Goyal, V. (2002). Testing the pecking order theory of capital structure. *Journal of Financial Economics, 67,* 217-248.

Gapenski, L. (2006). *Understanding Healthcare Financial Management*. Chicago, IL: Health Administration Press.

Garrard, J. (1999). *Health sciences literature review made easy: The matrix method*. Gaithersburg: Aspen Publishers.

Griffith, J., & Alexander, J. (2002). Measuring comparative hospital performance. *Journal of Healthcare Management, 47*, 41-57.

Goldschmidt, P. (1986). Information synthesis: A practical guide. *Health Services Research, 21,* 215-237.

Grice, J., & Ingram, R. (2001). Tests of the generalizability of Altman's bankruptcy prediction model. *Journal of Business Research, 54*, 53-61.

Hoyle, R., Harris, M., & Judd, C. (2002). *Research Methods in Social Relations, 7th edition.* Belmont, CA: Wadsworth Publishing.

Jensen, M. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review, 76*, 323-329.

Kim, T., & McCue, M. (2008). Association of market, operational, and financial factors with nonprofit hospitals' capital investment. *Inquiry, 45,* 215-231.

Langabeer, J. (2006). Predicting financial distress in teaching hospitals. *Journal of Health Care Finance, 33,* 84-92.

Langabeer, J. (2007). The fallacy of financial heuristics. *Journal of Health Care Finance, 34,* 81-88.

Leifer, R., & Delbecq, A. (1976). Organizational/environmental interchange: A model of boundary spanning activity. *Academy of Management Review, 3,* 40-50.

Lynn, M., & Wertheim, P. (1993). Key financial ratios can foretell hospital closures. *Health Care Financial Management, 47,* 66-70.

McCue, M. (2007). A market, operation, and mission assessment of large rural for-profit hospitals with positive cash flow. *National Rural Health Association, 23,* 10-16.

McCue, M., & Diana, M. (2007). Assessing the performance of freestanding hospitals. *Journal of Healthcare Management, 52,* 299-308.

Morey, J., Scherzer, G., & Varshney, S. (2003). Predicting financial distress and bankruptcy for hospitals. *Journal of Business and Economics Research, 2,* 89-96.

Mudambi, R., & Pedersen, T. (2007). *Agency theory and resource dependency theory: complementary explanations for subsidiary power in multinational corporations*. Denmark: Copenhagen Business School, Center for Strategic Management and Globalization.

Pink, G., Holmes, M., Alpe, C., Strunk, L., McGee, P., & Slifkin, R. (2006). Financial indicators for critical access hospitals. *National Rural Health Association, 22,* 229-236.

Price, C., Cameron, A., & Price, D. (2005). Distress detectors. Measures for predicting financial trouble in hospitals. *Healthcare Financial Management, 59,* 74-80.

Robert Wood Johnson Foundation. (1997). *The Robert Wood Johnson Foundation Annual Report, 1997.* Retrieved April 1, 2009 from http://www.rwjf.org/files/publications/annual/AnnualReport1997.pdf

Selzer, D., Gomez, G., Jacobson, L., Wischmeyer, T., Sood, R., & Broadie, T. (2001). Public hospital-based level I trauma centers: Financial survival in the new millennium. *The Journal of Trauma, Injury, Infection, and Critical Care, 51,* 301-307.

Shi, L. (2008). *Health Services Research Methods.* Clifton Park, NY: Thomson Delmar Learning.

Stucke, J. (2009, March 28). Spokane hospitals to trim workers. *Spokesman Review,* p. A1, A8.

Succi, M., Lee, S., & Alexander, J. (1997). Effects of market position and competition on rural hospital closures. *Health Services Research, 31,* 679-699.

Swayne, L., Duncan, W., & Ginter, P. (2006). *Strategic Management of Health Care Organizations.* Malden, MA: Blackwell Publishing.

Thompson, J., & McEwen, W. (1958). Organizational goals and environment: Goal-setting as an interaction process. *American Sociological Review, 23,* 23-31.

Younis, M., & Forgoine, D. (2005). Using return on equity and total profit margin to evaluate hospital performance in the U.S.: A piecewise regression analysis. *Journal of Health Care Finance, 31,* 82-88.

APPENDIX

APPENDIX A

Literature Review Matrix

	Author(s), Title, Journal	Year	Purpose	Location/Hospital/Hospital System	Study Design	Data	Results	Strengths & Weaknesses	Conclusions/Recommendations
1	Coyne, J., A Comparative Financial Analysis of Multi-Institutional Organizations by Ownership Type, Hospital & Health Services Administration	1985	To examine the financial growth trends of investor-owned and not-for-profit health care firms.	5 investor-owned and 9 non-profit multi-insitutional organizations (MIOs).	Analyzes financial trends from 1978 to 1982 for investor-owned and non-profit firms.	Audited data from four financial accounts (assets, debt, equity, income) and three financial ratios (liquidity, leverage, profitability).	Cash liquidity is the most sensitive measure of financial solvency. Also, long-term debt to equity, and return on investment are important measures that should be monitored by management.	(+) Analysis at the system-level. (-) Looks at financing trends rather than at specific solvency indicators.	Cash liquidity is an important component of growth and capital acquisition strategies. Capital access is the greatest strength for IO firms. Recommendation to continue joint ventures.
2	Wertheim, P., Key Financial Ratios can Foretell Hospital Closures, Healthcare Financial Management	1993	To develop a practical and accurate bankruptcy model that is predictive of hospital closure.	71 closed hospitals matched with 71 open hospitals	21 financial ratios were selected and grouped into categories of leverage, liquidity, capital efficiency, and asset availability. Ratios were calculated for each hospital at both one and two years prior to closure. To deterine differences between the two groups, means, SDs, chi-square tests, logit analysis, and analysis of variance were used.	Financial statements of all hospitals for the two years prior to closure.	Closed hospitals had higher leverage (debt), lower liquidity, capital efficiency, and asset availability ratios. 17 of the 21 ratios were significantly different one year prior to closure, and 8 ratios were significant 2 years prior. The most predictive variable (98%) was the profitability ratio net income to total revenues. The multivariate model with the highest predictive accuracy = total liabilities/total assets (leverage) + total assets/current liabilities (liquidity) + total revenue/total expenses (capital efficiency) + total assets/bed days available (resource availability).	(+) key results generated strong predictive power (+) medium-large sample size (-) compares findings to industry norm metrics	Multivariate model has a predictive accuracy of 75% one year prior to closure and 73.8% two years prior to closure. Management should compare their hospital's ratios to industry norms (hospital size).
3	Succi, M., Lee, S., & Alexander, J., Effects of Market Position and Competition on Rural Hospital Closures, Health Services Research	1997	To examine the dynamic effects of competition and hospital market position on rural hospital closures.	All rural community hospitals (except for sole providers in a market) operating between 1984 and 1991	A longitudinal, panel design that measured hospital closure as a function of hospital market position, market level competition, and control variables. Used discrete-time logistic regressions to test hypotheses.	AHA Annual Surveys of Hospitals, HCFA Cost Reports, Area Resource File, and a hospital address file created by Geographic Inc.	Rural hospitals operating in markets with higher density had higher risk of closure; rural hospitals that were more differentiated (geographic distances, provision of basic and high-tech services) had lower risks of closure; when market position was included in the model, the effects of market density disappeared. No statistically significant relationship was found for hospital size and risk of closure.	(+) strong sample size (+) longitudinal study design (-) approximations were used for the number of competing and noncompeting hospitals in the market area	Rural hospitals can decrease the liklihood of closure by differentiating themselves from market competitors and by accurately measuring market competition.

	Author(s), Title, Journal	Year	Purpose	Location/Hospital/Hospital System	Study Design	Data	Results	Strengths & Weaknesses	Conclusions/Recommendations
4	Broyles, R., Brandt, E., & Biard-Holmes, D., Networks and the Fiscal Performance of Rural Hospitals in Oklahoma: Are They Associated?, The Journal of Rural Health	1998	To explore the relation of network membership to the financial performance of rural hospitals in Oklahoma during fiscal year 1995.	60 short-term (34 network members and 26 non-network members), non-federal hospitals located in nonmetropolitain areas of Oklahoma	Compared the fiscal performance of the 26 non-network hospitals with the 34 network hospitals from 1990 to 1995. Used multivariate techniques to examine the association of networks on net cash flow, cash receipts and cash disbursements, while controlling for other external relations, structural characteristics, operating attributes, and market conditions.	Survey of Rural Hospitals in Networks (SRHIN) and the Hospital Utilization and Planning Survey (HUPS)	Most hospitals joined a network because their fiscal performance was poor. 50% reported that joining a network improved their fiscal performance and net cash flow was higher, and expenses were lower for network hospitals.	(-) Did not control for case-mix. (-) State-specific.	Network participating hospitals were able to improve their net cash flow by incurring lower net operating costs, rather than by generating higher patient revenues via increased market power. The number of visits and the number of beds were more important correlates of net cash flow than was network membership.
5	Selzer, D., Gomez, G., Jacobson, L., Wischmeyer, T., Sood, R., & Broadie, T., Public Hospital-Based Level I Trauma Centers: Financial Survival in the New Millennium, The Journal of Trauma Injury, Infection, and Critical Care	2001	To determine the dependence of Level I trauma centers on Disproportionate Share Hospital (DSH) governmental funds and tax dollars.	Level I public urban trauma center in the state of Indiana	Review of 553 trauma patient billing records. Data on charges, costs, payments, and the source of reimbursement were collected from each record. Profit and loss margins were compared with and without government funds.	553 trauma patient billing records	With DSH funds and tax dollars, the trauma center experienced a positive return of $600,000. With a 32% decrease in DSH funds and without tax dollars, a loss of $2.1 million was realized for the same six month period of time with the same patients. Blunt injury patients generate the greatest loss; thermal injury patients generate the greatest profits.	(+) Demonstrates the significant of government supplemental funds on predicting financial solvency in trauma centers. (-) Looks only at these two predictors, with a strong clinical focus. (-) Unit of analysis is the patient, rather than the hospital.	Cuts in government reimbursements to level I trauma centers will have a significant impact on the bottom line; renegotiate contracts with correctional institutions and elicit funds from other public sources in order to remain financially solvent

Literature Review Matrix, continued

	Author(s), Title, Journal	Year	Purpose	Location/Hospital/Hospital System	Study Design	Data	Results	Strengths & Weaknesses	Conclusions/Recommendations
6	Griffith, J., & Alexander, J., Measuring Comparative Hospital Performance, Journal of Healthcare Management	2002	To determine the content validity, reliability, and sensitivity of nine measures for evaluating U.S. hospitals.	3,000 hospitals	Empirically evaluates a set of nine hospital performance measures derived from Medicare reports using the Balanced Scorecard (BSC) approach. Measures are evaluated according to their ability to compare hospital performance and guide a strategy-setting process.	Medicare annual data sets (Solucient) consisting of information from 3,000 hospitals, American Hospital Association annual survey	All measures except two (occupancy-based) have content validity; asset turnover, cash flow, mortality, complications, and cost per case measures are important for comparing hospital performance. Higher scored hospitals have a weaker cash flow.	(-) Does not consider quality measures (+) The only study to asses the reliability, validity, and sensitivity of measures. (-) Included outliers up to 6 SDs, so a few outliers could significantly skew the results	Hospitals with excellent scores in mortality and complications appear to adapt more rapidly than others - moving to oupatient care and shorter LOS; a Medicare-based measurement set can help hospitals improve their mission achievement;
7	Cleverley, W., & Baserman, S., Patterns of Financing for the Largest Hospital Systems in the United States, Journal of Healthcare Management	2005	To identify and analyze key issues in the patterns of financing for large hospital systems.	10 large hospital systems (5 investor-owned, 5 voluntary)	Assessed the differences in financing used by large investor-owned health systems versus voluntary health systems.	Audited financial statements from 2004 from 10 large health systems.	Investor-owned use more debt financing and thus have much higher ROEs. Voluntary systems have much higher cash and investment reserves. All 10 systems have greater degress of financial leverage than do freestanding hospitals.	(-) Descriptive rather than predictive of hospital solvency indicators. (+) Provides insight into financing at the system-level.	There are differences in the financing patterns of large investor-owned and voluntary health systems.
8	Younis, M., & Forgoine, D., Using Return on Equity and Total Profit Margin to Evaluate Hospital Performance in the US: A Piecewise Regression Analysis, Journal of Health Care Finance	2005	To investigate hospital profitability by comparing total profit margin and return on equity as measures of profitability.	3,420 hospitals in 1996 and 3,461 in 1998	Compared total profit margin (TPM) and return on equity (ROE) as measures of profitablity in hospitals.	Medicare cost reports	ROE had a low predictive value. TPM had more explanatory power; most of the variables in this model were significant. FP had a higher profit margin and ROE than NPs.	(+) Large sample size, controlled for an exhaustive list of variables. (-) Equity measurement was not consistent across all hospitals. (+) Compared the accuracy of two profitability measures.	TPM is a superior measure to ROE for assessing hospital profitability. Profitability is influenced mostly by location, size, occupancy rate, volume of Medicare/Medicaid patients, and teaching status.

Literature Review Matrix, continued

	Author(s), Title, Journal	Year	Purpose	Location/Hospital/Hospital System	Study Design	Data	Results	Strengths & Weaknesses	Conclusions/Recommendations
9	Langabeer, J. Predicting Financial Distress in Teaching Hospitals, Journal of Health Care Finance	2006	To develop a model that will predict financial distress in teaching hospitals.	50 teaching hospitals	Analyzed balance sheet and income statement data for 50 teaching hospitals. Used the Altman Z-score model to determine which variables had influence on a hospital's Z-score according to Pearson correlations and multiple linear regressions.	Balance sheet and income statement data for 50 randomly selected teaching hospitals for 3 years--2002 to 2004.	Operating margin alone does not successfully indicate the real financial condition of hospitals. Hospitals near bankruptcy tend to hold on to cash longer. High performing hospitals had almost 13 times the net working capital. Overall Z-score, amount of debt per bed, days of working capital, operating margin, days of cash on hand, number of outpatient visits, and number of discharges were all statistically significant.	(+) This is the first study applying the Altman Z-score to hospitals. (+) Offerred excellent managerial implications. (-) Findings rely upon the predictability/reliability of the Z-score, introducing the limitation of multicolinearity.	Teaching hospitals are a group in financial distress, leading to a potential increase in M & As or divestitures of assets and services. Nearly 1/6 teaching hospitals was found to be near immediate bankruptcy.
10	Langabeer, J., The Fallacy of Financial Heuristics, The Journal of Health Care Finance	2007	To explore the effectiveness of ratios gauging debt and cash on hand for analyzing hospitals' financial strength.	40 hospitals in a competitive market in NYC	Analysis of financial strength thru statistical models were conducted to determine the link between traditional heuristics and long-term economic results. Looked at 30 operational and financial indicators.	Medicare cost reports and audited financial statements through Ingenix's Financial Benchmarking database	Organizations require different cash-debt positions based on their overall financial health. A one number heuristic does not fit all. The number of beds, average operating margin, days of cash on hand, z-score, debt per bed, and fund balance (accumulated retained earnings) were all statistically significant. For low-performing hospitals, debt and cash are inversely related, but very high-performing hospitals have a positive relationship.	(-) Omitted smaller, specialty hospitals. (-) Analysis of a single state (NY).	Financially insecure hospitals need to be building free cash flow and minimizing debt service while financially secure hospitals need to minimize cash on hand while reducing debt. Each organization should model decisions comprehensively.
11	McCue, M., A Market, Operational, and Mission Assessment of Large Rural For-Profit Hospitals with Positive Cash Flow, The Journal of Rural Health	2007	To gain insight regarding the driving factors behind the high cash flow performance of large rural for-profit hospitals.	Large rural hospitals affiliated with a system (39 for-profit and 58 non-profits)	Large, rural for-profit hospitals with positive cash flow margins were compared to a similar comparison group of large non-profit hospitals to assess underlying market, operational, and mission factors. Used logistic regression analysis.	CMS cost report data for 3 years	Operational measures were statistically significant: For-profits had lower operating expenses per adjusted discharge, and lower salary expense as a percentage of total operating expense. For-profits also treated a greater proportion of Medicaid patients.	(+) Looked at market, operational and mission factors. (-) Applies to large rural hospitals only.	For-profits placed a greater focus on controlling labor costs and operating costs per discharge in order to achieve greater positive cash flow.

Literature Review Matrix, continued

	Author(s), Title, Journal	Year	Purpose	Location/Hospital/Hospital System	Study Design	Data	Results	Strengths & Weaknesses	Conclusions/Recommendations
12	McCue, M., & Diana, M., Assessing the Performance of Freestanding Hospitals, The Journal of Healthcare Management	2007	To gain insight into the driving factors behind freestanding hospitals with positive cash flow.	Freestanding, nonfederal, short-term, acute care general hospitals with more than 50 beds and three years of annual cash flow data	Looked at the market, management, financial, and mission factors associated with freestanding hospitals with positive cash flows, relative to those w/o positive cash flows. Used logistic regression to analyze 17 variables.	Annual surveys of the American Hospital Association, cost reports from CMS, and the Area Resource File of the Health Resources and Services Administration	Freestanding hospitals with positive cash flows were found to have a greater market share, were located in markets with more physicians and fewer acute beds, have fewere unoccupied beds, higher net revenues, greater liquidity, less debt, treated fewer Medicare patients.	(+) Large sample size. (-) Hospitals were placed in the comparison group if they did not have positive cash flow for one out of three years only.	Cash flow margin, Medicare HMO penetration rate, market share, occupancy rate, Medicaid payer mix, cash and investments (as % of assets), long-term debt to capital, and age of plant are all factors associated with positive cash flows in freestanding hospitals.
13	Coyne, J. & Singh, S., The Early Indicators of Financial Failure: A Study of Bankrupt and Solveny Health Systems, Journal of Healthcare Management	2008	To identify which financial measures show the clearest distinction between success and failure.	13 health systems	Compared financial measures for solvent and insolvent health systems to detect the early warning signs using a longitudinal analysis. Looked at 7 financial solvency ratios: four cash liquidity measures, two leverage measures, and one efficiency measure.	7 years of annual statements from the Securities and Exchange Commission for 13 health systems.	Distinct differences in financial trends between solvent and insolvent health systems. Operating cash flow percentage change, operating cash flow to net revenues, and cash flow to total liabilities were all significant.	(+) Identifies key ratios with predictability. (-) Limitations resulting from missing data. (-) Cash management of large solvent firms may be different, or for different ownership types.	The hospital industry is sensitive to cash flow management, thus there is a great need to fund operations with cash.
14	Kim, T., & McCue, M., Association of Market, Operational, and Financial Factors with Nonprofit Hospitals' Capital Investment, Inquiry	2008	To gain insight into the changes in market, operational, and financial factors that may have influenced hospital capital investment.	Panel of nonprofit hospitals	Looked at the market, operational, and financial factors associated with capital investment decisions of a panel of nonprofit hospitals between 1998 and 2001. Used the organizational-environmental interaction and resource dependency theory as the theoretical framework.	CMS Medicare Cost Reports, American Hospital Association Annual Survey database, Area Resource File, CMS case-mix index, American Health Planning Association, InterStudy HMO penetration rates	URBAN HOSPITALS: An increase in the proportion of PCPs has a considerably large influence, unemployment rate had an inverse relationship, liquidity and cash flow had a positive, statistically significant coorelation. Debt ratio did not have a significant effect on the capital investment rate. Operational factors did not have an effect. RURAL HOSPITALS: Population over 65 and liquidity were postively coorelated, age of plant was inversely coorelated. No operational factors.	(-) findings are limited to the extent to which capital investment decisions predict financial viability, (+) use of multiple models and multiple dependent variables	Hospitals experiencing declining cash flows should not stop reinvesting in their facilities, rural hospitals may need to consider investing in facilities that accommodate the elderly, hospital capital investment is strongly coorelated with liqudity and cash flow, BBA may have caused a decline in cash flows, internal funds are critical to capital investments.

APPENDIX B

Financial Indicators

Indicator	Author(s)	Year	Significant
% of variable debt	Cleverly & Baserman	2005	No
% revenue from outpatient care	Griffith & Alexander	2002	Yes
Altman's Z-score	Langabeer	2006	Yes
Altman's Z-score	Langabeer	2007	Yes
Asset turnover	Griffith & Alexander	2002	Yes
Average net income	Langabeer	2006	No
Average operating margin	Langabeer	2007	Yes
Capital lease obligations	Cleverly & Baserman	2005	No
Cash % to total LTD	Cleverly & Baserman	2005	No
Cash and investments as a % of assets	McCue & Diana	2007	Yes
Cash and reserves	Cleverly & Baserman	2005	No
Cash flow	Kim & McCue	2008	Yes
Cash flow margin	Griffith & Alexander	2002	Yes
Cash flow margin	McCue & Diana	2007	Yes
Cash flow to total debt ratio	Succi, Lee, & Alexander	1997	Yes
Cash liquidity	Coyne	1985	Yes
Current maturity on LTD	Cleverly & Baserman	2005	No
Days cash on hand	Coyne & Singh	2008	No
Days cash on hand	Langabeer	2006	Yes
Days cash on hand	Langabeer	2007	Yes
Days of AR	Langabeer	2006	No
Days of receivables	Coyne & Singh	2008	No
Days of working capital	Langabeer	2006	Yes
Debt per bed	Langabeer	2007	Yes
Debt ratio	Kim & McCue	2008	No
Debt service coverage	Coyne & Singh	2008	No
Debt to equity	Coyne & Singh	2008	No
Dollar amount of fixed financing	Cleverly & Baserman	2005	No
Dollar amount of variable financing	Cleverly & Baserman	2005	No
Dollar of debt per bed	Langabeer	2006	Yes
Expense/service	Broyles, Brandt, & Biard-Holmes	1998	Yes
Fund balance (accumulated retained earnings)	Langabeer	2007	Yes
Liquidity [(cash + short-term + long-term investments)/beginning of year fixed assets]	Kim & McCue	2008	Yes
LTD to capital	McCue & Diana	2007	Yes
LTD to equity	Cleverly & Baserman	2005	No
LTD to equity	Coyne	1985	Yes
Net cash flow/# of services	Broyles, Brandt, & Biard-Holmes	1998	Yes
Net income to total revenues	Lynn & Wertheim	1993	Yes

Financial Indicators, continued

Indicator	Author(s)	Year	Significant
Net patient revenue per adjusted discharge	McCue & Diana	2007	No
Notional amount of swap (interest rate)	Cleverly & Baserman	2005	No
Operating cash flow percentage change from prior year	Coyne & Singh	2008	Yes
Operating cash flow to net revenues	Coyne & Singh	2008	Yes
Operating cash flow to total liabilities	Coyne & Singh	2008	Yes
Operating expense per adjusted discharge	McCue	2007	Yes
Operating margin	Langabeer	2006	Yes
Return on equity	Younis & Forgoine	2005	No
ROI	Coyne	1985	Yes
Salary and benefit expense as a % of operating expense	McCue	2007	Yes
Stockholder's equity	Cleverly & Baserman	2005	No
Swap % to total LTD	Cleverly & Baserman	2005	No
Total assets/bed days available (hospital resource availability measure)	Lynn & Wertheim	1993	Yes
Total assets/current liabilities	Lynn & Wertheim	1993	Yes
Total liabilities/total assets	Lynn & Wertheim	1993	Yes
Total LTD	Cleverly & Baserman	2005	No
Total profit margin	Younis & Forgoine	2005	Yes
Total revenue/total expenses	Lynn & Wertheim	1993	Yes

Market Indicators

Indicator	Author(s)	Year	Significant
Beds per capita	McCue & Diana	2007	Yes
CON stringency	Kim & McCue	2008	No
Disproportionate share	Selzer, Gomez, Jacobson, Wischmeyer, Sood, & Broadie	2000	Yes
Disproportionate share	Younis & Forgoine	2005	Yes
Extent of differentiation	Succi, Lee, & Alexander	1997	Yes
Geographic location	Younis & Forgoine	2005	Yes
Growth in population	McCue	2007	No
Growth in population over the age of 65	McCue	2007	No
Hirshman-Herfindahl index	Kim & McCue	2008	No
HMO penetration	Kim & McCue	2008	Yes
Market concentration	Succi, Lee, & Alexander	1997	No
Market density	Succi, Lee, & Alexander	1997	Yes
Market level competition	Succi, Lee, & Alexander	1997	Yes
Market share	McCue & Diana	2007	Yes
Market share	McCue	2007	No
MDs to population	Kim & McCue	2008	No
Medicaid discharges to total discharges	Kim & McCue	2008	No
Medicaid payer mix	McCue	2007	Yes
Medicaid payer mix	McCue & Diana	2007	Yes
Medicare HMO penetration rate	McCue & Diana	2007	Yes
PCPs to all MDs	Kim & McCue	2008	Yes
Per capita income	Kim & McCue	2008	No
Per capita income	McCue	2007	No
Per capita income	McCue & Diana	2007	No
Per capita income	Succi, Lee, & Alexander	1997	No
Physicians per capita	McCue & Diana	2007	Yes
Population density	Succi, Lee, & Alexander	1997	No
Population over 65	Kim & McCue	2008	Yes
Population size	Kim & McCue	2008	No
Rural index	Broyles, Brandt, & Biard-Holmes	1998	Yes
Sole community hospital (yes or no)	McCue	2007	Yes
Sole Medicare provider	Younis & Forgoine	2005	Yes
Unemployment rate	Broyles, Brandt, & Biard-Holmes	1998	No
Unemployment rate	Kim & McCue	2008	Yes
Unemployment rate	McCue	2007	No
Unemployment rate	McCue & Diana	2007	No

Operational Indicators

Indicator	Author(s)	Year	Significant
# of admissions/# of staffed beds	Broyles, Brandt, & Biard-Holmes	1998	Yes
# of admitting physicians/# of staffed beds	Broyles, Brandt, & Biard-Holmes	1998	No
Age of plant	Kim & McCue	2008	Yes
Age of plant	McCue & Diana	2007	Yes
Average age of plant	Langabeer	2006	No
Average length of stay	Broyles, Brandt, & Biard-Holmes	1998	Yes
Average length of stay	Langabeer	2006	No
Average length of stay	Younis & Forgoine	2005	Yes
Case-mix index	Kim & McCue	2008	No
Change in occupancy	Griffith & Alexander	2002	No
Complications	Griffith & Alexander	2002	Yes
Converted	Younis & Forgoine	2005	No
Cost per case	Griffith & Alexander	2002	Yes
Critical access	Younis & Forgoine	2005	Yes
FTEs per census	McCue & Diana	2007	No
High-tech services offerred (yes or no)	Kim & McCue	2008	No
Hospital size (number of staffed beds)	Succi, Lee, & Alexander	1997	Yes
JCACHO certified	Broyles, Brandt, & Biard-Holmes	1998	Yes
Length of inpatient stay	Griffith & Alexander	2002	Yes
Membership in a network	Broyles, Brandt, & Biard-Holmes	1998	Yes
Mortality	Griffith & Alexander	2002	Yes
Multihospital system affiliation	Succi, Lee, & Alexander	1997	No
Number of beds	Langabeer	2006	No
Number of beds	Langabeer	2007	Yes
Number of beds	McCue & Diana	2007	No
Number of beds	Younis & Forgoine	2005	No
Number of discharges	Langabeer	2006	Yes
Number of FTEs per 100 adjusted case-mix discharges	Younis & Forgoine	2005	Yes
Number of inpatient days	Langabeer	2006	No
Number of outpatient visits	Langabeer	2006	Yes
Number of services offered	Langabeer	2006	No
Number of services offered	McCue	2007	No
Number of services offered	McCue & Diana	2007	No
Number of staffed beds	Broyles, Brandt, & Biard-Holmes	1998	Yes
Number of staffed beds	McCue	2007	No
Number of visits	Broyles, Brandt, & Biard-Holmes	1998	Yes

Operational Indicators, continued

Indicator	Author(s)	Year	Significant
Occupancy	Griffith & Alexander	2002	No
Occupancy rate	Kim & McCue	2008	No
Occupancy rate	McCue	2007	Yes
Occupancy rate	McCue & Diana	2007	Yes
Ownership (FP,NP)	Younis & Forgoine	2005	Yes
Ownership (IO, gov, NP)	Succi, Lee, & Alexander	1997	Yes
Percent days public (Medicare & Medicaid days/total days)	Broyles, Brandt, & Biard-Holmes	1998	Yes
Percent occupied beds	Younis & Forgoine	2005	Yes
Ranking	Langabeer	2006	No
Reputation score	Langabeer	2006	No
Teaching status	Younis & Forgoine	2005	Yes