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*Healthcare expenditures represent a substantial aspect of the overall American economy. As a result, increasing pressure is being exerted upon virtually every organization in the healthcare sector to improve its performance. The goal of this research was to examine the core value adoption in American hospitals and its relationship to hospital safety. In addition, differences in core value usage between quality award-winning hospitals and non-award-winning hospitals were examined. Primary data were collected from 108 Minnesota hospitals and 17 quality award-winning hospitals. Secondary safety data were assembled from the Leapfrog database. The key findings in this study show that hospitals have widely varying abilities in implementing core values. Further, core values present differing levels of difficulty for the hospitals that are trying to accomplish them. The authors' findings also indicate that the ability to adopt core values is related to the overall safety. The principal conclusions are that the Baldrige core values exist in the form of a hierarchy within hospitals. Further, a hospital's ability to successfully adopt any particular core value is a function of its existing capabilities.*

*Key words: Baldrige Award, hospital culture, hospital safety, organizational values, Rasch Model Analysis*

## INTRODUCTION

Americans are facing a steady growth in healthcare costs. Overall healthcare spending in the United States for 2007 was about $2.2 trillion, which accounted for 16.2 percent of the gross domestic product (McLaughlin 2009). The Centers for Medicare and Medicaid Services (CMS) projects that healthcare spending will outpace the growth of the general economy by 2.1 percent per year for the 2008 to 2016 time period, which would mean by 2016 that one out of every five dollars in the U.S. economy would be going toward healthcare spending (Sisko et al. 2009). It is also predicted that the average annual cost of health insurance for an employer-supported family plan will rise to $24,000 by the year 2016 (Baucus 2009). As a consequence, healthcare expenditures have been a cause of concern for both policymakers and the healthcare industry.

One further study points out that 44,000 to 98,000 preventable deaths occur every year because of medical errors. These preventable injuries cost an extra $17 to $29 billion annually, which points to a quality issue that may also exist (Corrigan, Kohn, and Donaldson 2000). As a consequence, the overall dissatisfaction with the quality of healthcare in the United States is increasing. More than half (51 percent) of the American public said they were dissatisfied with the quality of healthcare in 2006, as compared to 44 percent in 2000 (Kaiser Foundation/Agency for Healthcare Quality and Research 2006).

The Institute of Medicine's (2001) report, "Crossing the Quality Chasm—A New Health System for the 21st Century," investigated some of these problems and concluded that the knowledge to improve patient care existed, but there was a gap, or chasm, that separated

practice from knowledge. The report highlights the need for a "new" healthcare system that is:

- Safe: Does not injure the patients it is intended to help or heal.

- Effective: Provides services based on proven science to everyone who could benefit and refrains from providing services to those who are not likely to benefit.

- Patient-centered: Provides care that is respectful of, and responsive to, individual preferences, needs, and values.

- Timely: Reduces waits and sometimes harmful delays for both care givers and patients.

- Efficient: Avoids waste, including waste of equipment, supplies, ideas, and energy.

- Equitable: Provides care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and/or socioeconomic status.

With administrative costs accounting for approximately 25 percent of total expenses (Healthcare Administrative Simplification Coalition 2009), healthcare organizations are adopting a variety improvement programs that not only focus on costs but also on patient safety and clinical outcomes. Programs such as the 100,000 Lives and 5 Million Lives campaigns are examples of these programs. Decisions, however, are becoming increasingly difficult as intensifying political and societal pressures confront healthcare decision makers.

Even though most hospitals are attempting to improve their performance, a significant issue is that not all hospitals are able to undertake key activities that will lead to necessary improvements. One study noted that hospitals needed to achieve certain levels of capability before being able to effectively implement desired improvement programs (Olson et al. 2008). To develop the required capability for developing sustained levels of performance, hospitals have to create a basic framework within their organizations.

The purpose of this study is to examine an important aspect of a hospital's fundamental structure and processes, its underlying set of core values. Further, this study will assess the impact of core values on hospital safety. In addition, it will identify whether differences exist in core values between award-winning hospitals and nonaward-winning hospitals. The findings of this study will be useful for hospital decision makers who are attempting to improve their quality of care, patient safety, and organizational processes.

## Baldrige Overview

One path that some hospitals have selected to improve their performance is through the Baldrige performance excellence program. From 2006 to 2008, 36 percent of the Malcolm Baldrige National Quality Award (MBNQA) winners were from the healthcare category. During the same time period, 60 percent of the awards in the Illinois state award program and 40 percent of the awards in the Texas state award program were given to healthcare applicants. Even though significant effort is required to achieve performance excellence, the increasing interest by healthcare providers has been fueled by the potential benefits that can accrue to program participants. The preceding comment is reflected in the 2009 MBNQA data where 42 of the 70 applicants were from the healthcare sector.

From a macro perspective, Link and Scott (2001) report that the net private benefits associated with the Baldrige National Quality Program (BNQP) to the economy as a whole are conservatively estimated to be $24.65 billion. When compared to the social costs associated with operating the program of $119 million, it is clear that from an evaluation perspective, the BNQP is socially beneficial. Individual research studies into the MBNQA and related award programs such as the European Quality Award (EFQM) have come in three areas. One area of research identified the consistency of the MBNQA as an overall concept (Lee, Rho, and Lee 2003; Ghosh et al. 2003; Flynn and Saladin 2001; Wilson and Collier 2000) and the consistency of the EFQM as an overall concept (Bou-Llusar, Escrig-Tena, Roca-Puig, and Beltran 2005). Another area of research found a linkage of the MBNQA relative to total quality management (TQM) (Prajogo and Sohal 2004; Curkovic, Melnyk, and Calantone 2000) and a linkage of the EFQM relative to TQM and the MBNQA (Bou-Llusar et al. 2009). A third area of research has examined organizational results in relation to the MBNQA. Specifically, the criteria

were positively related to financial and stock price performance of organizations (Hendricks and Singhal 1996; 1997; 2001a and 2001b; Rajan and Tamimi 1999) and positively related to organizational-specific results in hospitals (Goldstein and Schweikhart 2002).

The extant body of research has almost exclusively focused on the criteria for performance excellence because of its numerical perspective and direct relationship to the annual award. However, Mark Blazey, a noted Baldrige expert, states that the core values and concepts aspect of the MBNQA "serve as a foundation for the criteria, bind an organization, and yield high-performance" (Blazey 1997, 61). In fact, the core values are depicted as a basic foundation that is interwoven throughout the award criteria (BNQP 2009-2010, 52). As a foundation for the MBNQA criteria, the core values have experienced relatively few changes throughout the history of the award program. Yet, relatively little empirical research has been done with respect to the core values, even though they serve as the foundation for the criteria for performance excellence.

Even though the core values have not been a research focus, several studies have viewed the role of culture within hospitals. The clear linkage of culture and values has been recognized by Schein (1986; 1992; 2004). He describes values as the first discernible expression of an organization's culture. O'Reilly, Chatman, and Caldwell (1991, 491-492) further note, "values, whether conscious or unconscious, typically act as the defining elements around which norms, symbols, rituals, and other cultural activities revolve." Thus, values serve as an identifiable mechanism that influences the visible behaviors or patterns within an organization.

Within the studies that have viewed hospital culture, several influential values were documented. Shortell et al. (1995) found that cultures reflecting values related to empowerment, decentralized control, "just-in-time" training, and flexibility had greater success implementing TQM initiatives. Teamwork was found to be related to patient satisfaction (Strasser et al. 2002) and patient outcomes (Meterko, Mohr, and Young 2004). In addition, values that were related to leadership (McFadden, Henagan, and Gowen 2009) and entrepreneurial qualities (Hartmann et al. 2009) were

found to be influential on a culture of safety. Each of these studies identified values that were consistent with the Baldrige core values, which are described as "embedded beliefs and behaviors found in high-performing organizations" (BNQP 2009-2010, 51).

# RESEARCH QUESTIONS

Several research questions will be examined in this study. First, the authors will assess the psychometric validity of the questionnaire on core values employed in this study. A focal point of the psychometric analysis will be an examination of whether the core values exist as a unidimensional construct. As a result, this study will also examine whether all of the core values relate to the same basic construct of performance excellence, a central tenet within the BNQP. Second, the authors will examine whether any difference in core value usage emerges between a national sample of award-winning hospitals and a sample of nonaward-winning hospitals from Minnesota. Finally, the authors will examine the relationship between a hospital's ability to implement core values within their organization in relation to their level of overall safety.

# METHOD

This study investigates the usage pattern of core values within hospitals. A two-stage analysis of the data will be performed. The first stage identifies: 1) whether the core values exist as a unidimensional construct; 2) the level of capability of hospitals in carrying out core values; 3) and the relative difficulty of the core values themselves. The second stage of the analysis examines the relationship between the pattern of core value usage and hospital performance outcomes.

# Core Values Measure

The items in this survey were derived from the core values provided in the *Health Care Criteria for Performance Excellence* (BNQP 2007-2008). Specifically, scale items were developed based upon the definitions or descriptors provided for the 11 core values: visionary leadership, patient-focused excellence,

organizational and personal learning, valuing workforce members and partners, agility, focus on the future, managing for innovation, management by fact, societal responsibility and community health, focus on results and creating value, and systems perspective. The survey consisted of 63 items using a five-point Likert scale format.

A two-stage pretest was used to develop the final version of the survey. The initial version of the questionnaire was sent as a pilot survey to the state quality award program directors to ensure the accuracy of questions relative to the Baldrige core values. A revised version of the survey was then sent to the Minnesota Hospital Association (MHA) to improve upon the clarity of the questions within the hospital setting.

## Data Collection

The authors utilized a survey methodology to collect the data used to examine the research questions, with a hospital as the unit of analysis. For this study, data on core value usage were collected as part of a larger survey. The questionnaire was sent to members of the MHA and to a national sample of quality award winning hospitals.

The MHA sent the questionnaire to 143 Minnesota hospitals in 2007. Specifically, 674 selected members of upper-level hospital management received the questionnaire. Follow-up e-mails and a postcard reminder were sent to nonrespondents. As displayed in Table 1, responses were received from 210 individuals within 108 hospitals, resulting in an effective hospital response rate of 75.5 percent. The specific respondents to the questionnaire are as follows (the percentage of total respondents appears in parentheses): chief executive officers (20 percent), chief medical officers (5 percent), chief financial officers (11 percent), directors of nursing (23 percent), quality directors (30 percent), chief operating officers (1 percent), and all other titles (10 percent). At some hospitals, one individual had several roles and in other hospitals several individuals had the same role. It should be noted that the MHA did not have contact information for all individuals at every hospital. Multiple

**Table 1**  Hospital response rate and demographics.

| Hospital type | Number (Responded/Total) | Response rate |
|---|---|---|
| Minnesota | 108/143 | 75.5% |
| Baldrige award winner | 3/4 | 75% |
| Illinois award winner | 8/11 | 64% |
| Texas award winner | 2/2 | 100% |
| New Jersey award winner | 1/4 | 25% |
| Maryland award winner | 1/1 | 100% |
| Florida award winner | 2/4 | 50% |
| **Number of beds** | **Minnesota** | **Award winners** |
| less than 50 | 67 | 1 |
| 50 or more | 41 | 16 |

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responses from an individual hospital were combined to create a hospital core value profile.

In addition, the same questionnaire was sent to MBNQA hospital winners and quality award winning hospitals from the following states: Florida, Illinois, Maryland, New Jersey, and Texas. Within the healthcare category, 26 organizations were identified as hospitals, in contrast to healthcare systems. Questionnaires were sent to hospitals that had won an award during the 1996 to 2007 time period. Follow-up e-mails were sent to nonrespondents. The state award organizations participating in this study agreed to provide an endorsement letter as well as other relevant information (names, mailing addresses, and e-mail addresses, if available) for the official contact person at each of the award-winning hospitals. Similar information was obtainable for the hospitals receiving the Baldrige Award at the BNQP website. The survey was sent to the official contact person for the hospital. The official contact person is an individual who serves as the liaison with the award offices; however, he or she often has the widest ranging knowledge of the organization. The response rate for the combined grouping of award-winning organizations was 65.4 percent; the response rates for MBNQA winners and the award winners from each of the states are shown in Table 1.

# Outcome Measures

To assess the relationship of core values to hospital performance, the authors used demographic and quality outcome data from the Leapfrog Group (2007). The Leapfrog Group consists of major companies and other large private and public healthcare purchasers interested in improving the safety, quality, and affordability of healthcare. In 2001, the Leapfrog Group started collecting data to assess hospital performance based on proven safety practices. The Leapfrog Safe Practices Score is an overall safety measure that comprises 27 safe practice areas that were identified by the National Quality Forum. The Leapfrog Group rates a hospital's performance on each of these 27 safe practice areas. Each practice area is assigned an individual weight, which is factored into the overall score of 1,000 points. Specifically, the authors examined the Leapfrog Safe Practices Score from the Leapfrog Hospital Quality and Safety Survey to the Rasch ability score in implementing core values generated from their data.

# ANALYSIS AND RESULTS

The initial part of this study will utilize a Rasch model analysis (RMA). The model construction in this analysis is detailed in Appendix A. The RMA results show that when all of the core value items are taken together they define how performance excellence is achieved within hospitals. The output of the model construction is shown in Table 2 in Appendix A. Table 2 presents each of the core value items by the degree of difficulty of accomplishment. The most difficult items are presented at the top of Table 2, while the easiest core value items are at the bottom. The results of Table 2 can be graphically presented in the form of a Wright map, which is shown in Figure 1. The Wright map simultaneously depicts both the difficulty of the items that comprise the core values and the ability of a hospital to implement the core value items.

The vertical axis in the center of the Wright map serves as a statistical ruler that is used to measure both the difficulty of the individual core value items and the ability of hospitals to adopt the core value items. 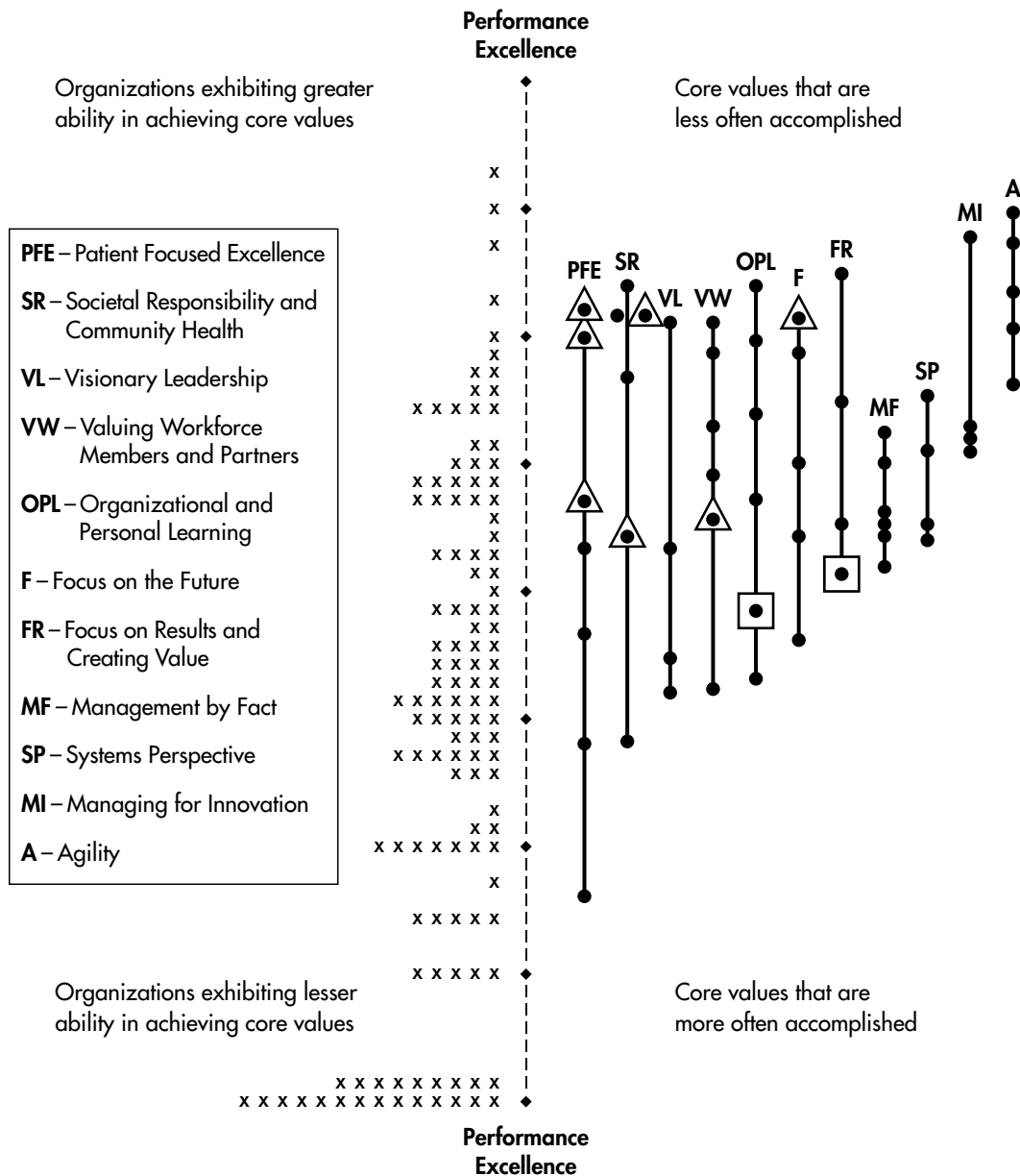The unit of measurement created by RMA on this ruler is a logit, which is denoted by the diamonds running the length of the vertical axis. The distance between any two contiguous diamonds is equal to one logit. The logits (diamonds) on the center axis provide an interval measure of distance.

To the left of the center axis, the distribution of hospitals is shown according to their ability to deploy the core value items in their organizations (each hospital is displayed as an "X"). Hospitals that are located higher on the center axis have been able to fully adopt more core value items than hospitals that are located lower on the center axis. In viewing this distribution, the top 25 percent of the hospitals exhibit statistically greater ability in implementing the core values than did the bottom 25 percent of the hospitals ($z = 2.11$). The distribution of core value items is located on the right side of the center axis. To clarify the presentation of the data, the core value items are grouped according to their *apriori* core value classification rather than in the sequential fashion presented in Table 2. Even though the individual items are grouped by their core values, it should be noted that they exist as a unidimensional representation of performance excellence. Those core value items that are located higher on the center axis have been implemented less frequently than those items that are lower on the center axis. When viewing the bottom 25 percent of the core value items relative to the top 25 percent, the authors observe that there is a statistically significant difference in difficulty ($z = 2.28$). Thus, the core value items higher on the center axis are frequently described as being more difficult to accomplish, while those at the bottom of the center axis are referred to as being easier to accomplish.

Because the distances exist as interval measures, certain assessments can be made concerning hospital practices. First, one can view the difficulty of specific core value items in relation to other core value items or the ability of one hospital relative to another hospital. If a particular core value item is one logit higher on the vertical axis than some other core value item, then it is twice as difficult to achieve as the lower core value item. Similarly, if a hospital is one logit higher on the vertical axis than another hospital, then it has twice the ability to implement the core values. In addition, a core

**Figure 1**   Wright map.



Performance
Excellence

Organizations exhibiting greater
ability in achieving core values

Core values that are
less often accomplished

PFE – Patient Focused Excellence

SR – Societal Responsibility and
     Community Health

VL – Visionary Leadership

VW – Valuing Workforce
     Members and Partners

OPL – Organizational and
      Personal Learning

F – Focus on the Future

FR – Focus on Results and
     Creating Value

MF – Management by Fact

SP – Systems Perspective

MI – Managing for Innovation

A – Agility

Organizations exhibiting lesser
ability in achieving core values

Core values that are
more often accomplished

Performance
Excellence

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value item that is one logit higher than a hospital's level of ability indicates that it is twice as difficult for a hospital to successfully implement that particular core value item as it is to implement a core value item that is situated at its current ability level. The same relationship holds for core value items that are below a hospital's level of ability. A core value item that is one logit lower than a hospital's level of ability means it is twice as easy to achieve.

A second part of the investigation uses a differential item functioning (DIF) analysis. The DIF analysis identifies whether any core value items show response patterns that differ between quality award winning hospitals and the non-award-winning hospitals. Figure 1 identifies seven core value items that are considered to be more difficult (triangles) and two core value items that are considered to be easier (squares) for the non-award-winning hospitals (the

specific core value items are identified in Table 2). Most of the more difficult items for the non-award-winning hospitals tended to be more difficult core value items in general.

The third stage of analysis views a hospital's ability to deploy the core values within its organization in relation to its overall safety performance. To assess this relationship, the authors used the Rasch hospital ability scores along with the Leapfrog Safe Practices Score, where data were available (48 of the hospitals taking part in this study also participated in the Leapfrog survey). A regression analysis was undertaken using the Rasch hospital ability score and the relevant Leapfrog score. The number of hospital beds, case mix index, and urban or rural location were incorporated in the original analysis to control for differences among hospitals. The control variables were found to not be significant and they were consequently removed from the analysis. The outcome from the final model reveals that the Rasch hospital ability score is significantly correlated with the Leapfrog Safe Practices Score, $F(1, 123) = 5.932$, $p < 0.019$. The $r^2 = 0.114$ shows that approximately 11 percent of the total variance in the Leapfrog Safe Practices Score is explained by a hospital's ability to deploy the core values throughout its organization.

# DISCUSSION

The results of this study are noteworthy from several perspectives. First, the questionnaire used to gather the data was found to be a valid and reliable instrument. Second, the Baldrige core values were shown to exist as a unidimensional construct. That is, all of the core value items were related to the concept of performance excellence as identified in the BNQP literature. Third, differences in implementation patterns were observed for some of the core value items between award-winning hospitals and non-award-winning hospitals. Finally, the ability to implement core values within an organization accounted for a statistically significant amount of the variance in the use of safe practices as defined by the Leapfrog assessment.

In addition, several observations from Figure 1 were relevant from an overall hospital managerial

perspective. First, even though all of the core values related to performance excellence, there were varying levels of implementation difficulty among the core values. Second, the range of difficulty differed by core value. Third, becoming proficient in a particular core value generally requires that a hospital gain ability in other values.

Relative to the first observation, all of the core values proposed by the BNQP do indeed relate to performance excellence. All of the core values, however, are not equally easy to accomplish. If one examines Figure 1, one can see that the location of the "entry level" core value items vary by the particular core value. What is the importance of this observation? Simply, it means that some core values are far easier to put into action than others and can serve as basic starting points for hospitals that have lower overall levels of performance excellence. For example, Patient Focused Excellence, Societal Responsibility and Community Health, and Visionary Leadership core values have "entry level" core value items that are easier to accomplish than either Managing for Innovation or Agility. The "entry level" item for Agility is at least two logits higher (or three times as difficult) than the "entry level" items for Patient Focused Excellence, Societal Responsibility and Community Health, or Visionary Leadership.

The second observation relates to the range of difficulty for each core value. Again viewing Figure 1, one can observe that relatively large ranges exist within each of the core values. That is, all of the core values have items that span one or more logits from the easiest item to the most difficult item within a particular core value. Restating this observation in operational terms, one would say that the most difficult item has at least twice the difficulty of the easiest item for a particular value. If one calculates the z-scores using the formula presented earlier to examine these differences, one can note that the hardest item is statistically more difficult to accomplish than the easiest item (z-scores ranged from 2.41-5.08) for all of the core values except Systems Perspective, Managing for Innovation, and Agility.

The third observation comes from the distribution of items within the individual core values. In particular,

there are gaps among items that exist within all of the core values. There can be a variety of reasons why the gaps exist; however, the central issue for hospital executives is that the gaps create greater levels of difficulty or barriers in trying to accomplish a particular value. Sometimes the items are distributed relatively equally throughout a value and sometimes significant gaps exist among items within a value. In some cases, the gap between two items within a value is one logit or more. As a consequence, it may be harder and involve significant resources to fully master some values. The significance of the gaps is that it may be difficult for a hospital to concentrate its focus solely on accomplishing a single value. Assume a hospital decides to pursue the core value of Societal Responsibility and Community Health, which is a value that has a relatively easy starting point. In viewing this value, the Wright map shows this core value requires a large range of performance. After a hospital successfully accomplishes the initial step in Societal Responsibility and Community Health, for example, the next higher level item is more than twice as difficult to accomplish as the one that was just achieved. Facing this large gap, the hospital has two choices: 1) it can apply considerably greater amounts of resources (time, people, and money) in an effort to offset the greater chance of failure in attempting to directly achieve this next more difficult item; or 2) it can increase its overall capability by attaining easier practices that are related to other values such as Visionary Leadership, Organizational and Personal Learning, or Focus on the Future.

In addition to the preceding general observations about core values, there are the specific findings related to the DIF analysis. One of the more difficult core values for the non-award-winning hospitals was Patient Focused Excellence, where three of the seven most difficult items resided. In addition, "providing employees with recognition beyond just traditional compensation" and "allocating resources based upon changes in competition or technology" were more difficult behaviors for the non-award-winning hospitals to accomplish. Actions that seemed to be easier for the non-award-winning hospitals focused on "eliminating adverse impacts on our stakeholders" and "emphasizes the sharing of knowledge throughout the organization."

# Limitations

Several limitations exist in this study. First, the nonaward-winning sample of hospitals used in this study consisted exclusively of hospitals located in Minnesota. Second, the authors assumed that the type of respondents they chose (higher managerial levels in the Minnesota hospitals and the official contact person in the award-winning organizations) would have knowledge of the core value items implemented within their hospitals. Finally, the core value items examined in this study consisted of a representative list, and some notable core value items may have been excluded.

# CONCLUSIONS AND RECOMMENDATIONS

The results of this study essentially provide a road map for hospital executives who are trying to increase the performance of their hospitals. This road map clarifies the nature of the hierarchical relationship that exists among the core values within hospitals. Based upon these findings, several recommendations would seem to be relevant:

- The results illustrate that some core values are easier to implement when other lower-level core values have already been implemented within the hospital.

- Rather than focusing on specific core values, however, this research would suggest that hospital executives should focus on specific activities that are near their level of current capability. In this way, hospitals can use their resources most effectively to increase their level of performance. The preceding point is particularly evident when viewing differences between award-winning hospitals and non-award-winning hospitals. Some activities, in the Patient Focused Excellence core value, for example, are especially difficult for the non-award-winning hospitals to accomplish.

- As a result, a key recommendation for the hospital executive is that the current level of capability of their hospital needs to be accurately defined. As a hospital increases in its level of performance

excellence, it will ultimately be able to achieve all of the core values.

- Finally, this study has shown that performance excellence is related to hospital safety. Prior research, however, has shown that the ability to implement improvement programs is also related to hospital safety (Olson et al. 2008). When viewed together, these studies would seem to suggest that hospitals focusing both on their processes (core values) and improvement programs simultaneously may be able to reap even greater gains in performance.

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# APPENDIX A: RASCH MODEL ANALYSIS

The data analysis initially employed Rasch Model Analysis (RMA), which is commonly classified as a latent trait analysis. Traditionally, RMA has been employed to validate tests and other measurement instruments. In this study, RMA will serve a dual purpose: to validate the questionnaire and to describe an underlying factor that cannot be directly measured—performance excellence. Relative to this analysis, Borsboom, Mellenbergh, and Japp (2003, 205) duly note, "Although the model cannot be tested directly for any given item because the independent variable is latent, it can be tested indirectly through its implications for the joint probability distribution of the item responses for a number of items." In this study, the authors will consider whether hospitals can be characterized by their use of core values within their organizations.

The Rasch model will examine whether the data correspond to a specific, basic underlying structure. It will accomplish this task by employing two basic parameters: difficulty ($\delta$) and ability ($\beta$). Specifically, RMA is a logistic model that provides a statistically independent method for assessing both core values and hospitals on an underlying factor or dimension. In the current study, it suggests that a core value item's difficulty ($\delta$) and a hospital's ability to accomplish a specific core value item ($\beta$) can be positioned on the same latent variable. It is anticipated that the individual core value items in hospitals present varying degrees of difficulties, where more difficult items will be accomplished less frequently. In particular, the Rasch difficulty parameter ($\delta$) is used to locate these core value items along a continuum of performance excellence. In like fashion, the Rasch ability parameter ($\beta$) conjointly locates a hospital according to its ability to implement core value items on the same fundamental continuum. The most common form of the Rasch model is characterized by the following equation: $p = \exp(\beta - \delta) / [1 + \exp(\beta - \delta)]$.

RMA is used because of several important attributes. First, RMA can be used to assess unidimensionality, which means all core value items are related to the same fundamental variable—performance excellence. In addition, local independence exists among the data; that is, the selection of a core value item is not related to other core value items. As a consequence, one can determine not only whether the questionnaire used in this study has psychometric validity, but more importantly, whether core values items are all related and represent the construct of performance excellence. The practical result is that "individual differences can be mapped on a single real number line" (Andrich 1988, 9). Second, an additive relationship exists among the data. Hence, RMA transforms data into a true interval scale (Bond and Fox 2001). The net result is that RMA allows the interpretation of differences among hospitals in their ability to implement core values. Third, the same data can be used for both estimating and testing solutions (Rasch 1960/1980; Wright and Stone 1979; Wright and Masters 1982). A final characteristic comes from a fundamental RMA requirement—invariance. This attribute means that core value items can be viewed independently of the hospitals in this analysis. Through their linear differences, only the parameters of ability and difficulty are viewed as the basis for the

observed data. When the data meet all of the requirements of RMA, the results are expected to be sample independent. That is, the results are relevant to other groups that are regarded to be part of the same population even though they were not part of the development process (Wright and Linacre 1987; Drehmer, Belohlav, and Coye 2000).

# MEASUREMENT PROPERTIES

A focus of this study is on viewing hospitals that were able to fully deploy or implement particular core value items throughout their organization. So, the data were rescored from a Likert-scale format to reflect this focus. That is, levels of performance that resulted in less than full organizational deployment were combined together, which resulted in dichotomous data. RMA is made up of a family of models for different types of data. To analyze the data in this study, the original Rasch model for dichotomous data was used (Georg Rasch 1960/1980), which creates interval level output as part of the analysis.

The initial portion of this analysis focuses on assessing how well the data fit the expectations of the Rasch model. When there is an acceptable fit, it signifies that an underlying element exists that is common to all of the variables. A basic distinction between conventional types of analysis and RMA is captured in the following remark, "Fit statistics in Rasch analysis serve a different purpose from those in regression analysis. In descriptive statistical methodology, fit statistics are used to discover a model that fits the data well enough that the data could be considered to have been generated by the model. In Rasch analysis, the model is already chosen. The purpose of the fit statistics is to aid in measurement quality..." (Smith 1996, 516). It is worth noting that Rasch measures exist as unidimensional and linear measures. As a result, the present analysis views whether the data diverge from the expectations of the Rasch model.

Linacre (1998) suggests a three-phase process that progressively ascertains the degree of fit between the data and the expectations of the Rasch model. The first phase assesses whether discrepancies exist in the latent variable. Next, the individual variables are

examined to consider how much useful information they contribute to the model construction. These first two phases examine how well the data correspond to the unidimensional requirement of the Rasch model. The third phase views whether any other alternative competing explanations exist that can account for the results. This three-phase process evaluates the validity of the model. In addition, one also considers overall model reliability. Winsteps version 3.63.2 (Linacre 2006) was used in the data analysis.

In the first phase, the correspondence of each variable to the total model is undertaken. The point measure correlation, $r_{pm}$, is used to consider the content validity of the core value items. The point measure correlation observes the level of agreement for each core value item with the whole model. Specifically, one is concerned with the sign of the correlation. Variable signs should be positive to remain as part of the analysis, which is what is observed in Table 2.

In the second phase of the model construction, the authors consider how well the individual variables fit the expectations of the Rasch model. In the extant literature, two measures have been generally used to measure the level of fit of variables relative to the Rasch model expectations: the mean square fit statistic (MNSQ) and the traditional z-score (ZSTD). In this study both measures will be used as criteria. A core value item will be deemed to meet the expectations of the Rasch model if: 1) it has a mean-square within the range of 0.5 to 1.5 (Linacre 2002; Linacre 2003); and 2) it is normally distributed ($\pm$ 2 standard deviations).

RMA calculates an expected value for each hospital and each core value item. When the data in this study deviate from the Rasch expected value, the extent of misfit is detected by the fit statistics. There are two types of fit that are commonly used in RMA: the outfit statistic and the infit statistic. The outfit statistic views deviations between observed and expected values for core value items that are distant from a particular hospital's capability. This statistic is a traditional sum of squared standardized residual. The infit statistic views deviations between observed and expected values for core value items that are relatively near a particular hospital's capability. This statistic exists as an information-weighted

| Table 2 | Summary of major characteristics of case companies. | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Core value items | Core value | Measure | SE | Infit | ZSTD | Outfit | ZSTD | $r_{pm}$ |
| Reduces time to enhance quality or cost | A5 | 2.04 | 0.45 | 0.87 | -0.3 | 0.64 | 0.0 | 0.30 |
| Focuses on reducing the time it takes to get a product or service to a patient | A4 | 1.85 | 0.42 | 0.99 | 0.1 | 0.65 | 0.0 | 0.28 |
| Innovation that leads to improvements in our products, services, and operations | MI4 | 1.68 | 0.40 | 0.88 | -0.4 | 0.63 | -0.1 | 0.33 |
| Use measures that "lead" actual performance so that changes can be made to our operations before adverse impacts become visible | FR4 | 1.63 | 0.38 | 0.87 | -0.4 | 0.54 | -0.3 | 0.36 |
| Bases pay upon an individual's knowledge and skills | OPL6 | 1.49 | 0.36 | 0.93 | -0.2 | 0.91 | 0.2 | 0.34 |
| Conservation of environmental resources and waste reduction | SR6 | 1.49 | 0.36 | 1.03 | 0.2 | 0.70 | -0.1 | 0.32 |
| Empowers its employees | A3 | 1.36 | 0.35 | 0.94 | -0.2 | 0.58 | -0.4 | 0.37 |
| Allocates resources based upon changes in competition or technology | F5* | 1.26 | 0.35 | 0.99 | 0.0 | 0.69 | -0.2 | 0.34 |
| Develops an awareness of technology and competitor offerings | PFE7* | 1.24 | 0.34 | 1.00 | 0.1 | 1.13 | 0.4 | 0.34 |
| Inspires employees | VL4 | 1.15 | 0.34 | 1.01 | 0.1 | 0.60 | -0.4 | 0.37 |
| Uses flexible work practices based upon both workplace and home life needs | VW6 | 1.15 | 0.34 | 1.19 | 0.9 | 1.45 | 0.8 | 0.27 |
| Utilizes competitive comparisons to improve our operations | MF6 | 1.13 | 0.33 | 0.95 | -0.2 | 0.86 | 0.0 | 0.37 |
| Differentiates our products and services from our competition | PFE6* | 1.13 | 0.33 | 1.13 | 0.7 | 0.95 | 0.2 | 0.32 |
| Anticipates the adverse environmental or social impacts of our operations | SR5 | 1.13 | 0.33 | 0.97 | -0.1 | 0.69 | -0.3 | 0.38 |
| Actively makes information available to the public on organizational ethics, public health, safety, and the environment | SR4* | 1.13 | 0.33 | 1.20 | 1.0 | 1.21 | 0.5 | 0.30 |
| Creates partnerships with other organizations on issues relating to public responsibility and citizenship | SR3 | 0.83 | 0.31 | 1.01 | 0.1 | 0.76 | -0.2 | 0.40 |
| Focuses on managed levels of growth | F4 | 0.83 | 0.31 | 0.97 | -0.1 | 0.67 | -0.4 | 0.40 |
| Aligns our resources for faster response to our customers and patients | A2 | 0.83 | 0.31 | 0.93 | -0.3 | 0.64 | -0.4 | 0.42 |
| Makes changes in our operations based upon our learning | OPL5 | 0.74 | 0.30 | 1.08 | 0.5 | 0.85 | -0.1 | 0.39 |
| Internal partnering | VW5 | 0.74 | 0.30 | 0.84 | -0.9 | 1.13 | 0.4 | 0.45 |
| Makes decisions based upon actual results | SP4 | 0.64 | 0.30 | 1.00 | 0.0 | 0.77 | -0.2 | 0.41 |
| Sets clear expectations for their employees | VL3 | 0.57 | 0.29 | 1.22 | 1.3 | 0.91 | 0.0 | 0.36 |
| Utilizes measures that provide useful results | FR3 | 0.49 | 0.28 | 0.88 | -0.8 | 0.63 | -0.7 | 0.48 |
| Capacity for rapid change and flexibility | A1 | 0.49 | 0.28 | 0.92 | -0.5 | 0.71 | -0.5 | 0.46 |
| Involves nonmanagerial and nonsupervisory workers in regularly scheduled meetings to discuss work-related problems such as working conditions, health and safety, technology, and improving specific tasks | OPL4 | 0.48 | 0.28 | 0.99 | 0.0 | 0.70 | -0.5 | 0.45 |

**Table 2** Summary of major characteristics of case companies (continued).

| Core value items | Core value | Measure | SE | Infit | ZSTD | Outfit | ZSTD | $r_{pm}$ |
|---|---|---|---|---|---|---|---|---|
| Market share growth | PFE5* | 0.47 | 0.29 | 1.22 | 1.4 | 1.11 | 0.4 | 0.34 |
| Develops external partnerships with customers, patients, or suppliers | VW4 | 0.41 | 0.28 | 0.92 | -0.5 | 0.86 | -0.1 | 0.47 |
| Anticipates changes in the market | PFE4 | 0.39 | 0.28 | 1.18 | 1.2 | 1.34 | 0.8 | 0.36 |
| Encourages employees to be innovative | MI3 | 0.15 | 0.27 | 1.15 | 1.1 | 0.79 | -0.4 | 0.42 |
| Emphasizes market leadership | F3 | 0.00 | 0.27 | 0.92 | -0.6 | 0.73 | -0.5 | 0.51 |
| Identifies new ways to improve our performance | MI2 | -0.06 | 0.26 | 0.80 | -1.6 | 0.59 | -1.1 | 0.55 |
| Removes obstacles to improvements | MI1 | -0.10 | 0.27 | 0.89 | -0.8 | 0.70 | -0.7 | 0.53 |
| Aligns strategies with our organizational needs | SP3 | -0.13 | 0.26 | 0.79 | -1.7 | 0.58 | -1.1 | 0.56 |
| Provides opportunities for the personal development of its staff | VW3 | -0.14 | 0.26 | 1.01 | 0.1 | 0.85 | -0.3 | 0.49 |
| Collects information so that decisions can be made | MF5 | -0.23 | 0.27 | 1.00 | 0.1 | 0.82 | -0.4 | 0.51 |
| Provides training based upon organizational needs and priorities | OPL3 | -0.33 | 0.26 | 0.96 | -0.3 | 0.86 | -0.3 | 0.52 |
| Provides employees with recognition beyond just traditional compensation | VW2* | -0.58 | 0.25 | 1.19 | 1.6 | 1.11 | 0.5 | 0.46 |
| Improves existing measures to better meet organizational goals | MF4 | -0.62 | 0.24 | 0.85 | -1.3 | 0.69 | -1.1 | 0.59 |
| Measures key organizational processes | MF3 | -0.64 | 0.24 | 1.07 | 0.6 | 0.89 | -0.3 | 0.52 |
| Goes beyond simply meeting local, state, and federal laws and regulatory requirements | SR2* | -0.70 | 0.24 | 0.98 | 0.1 | 0.88 | -0.4 | 0.55 |
| Integrates its strategic objectives throughout the organization | SP2 | -0.70 | 0.25 | 0.83 | -1.5 | 0.64 | -1.3 | 0.61 |
| Participates in benchmarking programs that compare our practices and performances with other organizations | MF2 | -0.70 | 0.25 | 1.17 | 1.4 | 1.09 | 0.4 | 0.48 |
| Tries to balance the needs of our stakeholders (i.e., customers, patients, employees, suppliers, the public, and the community) | FR2 | -0.77 | 0.25 | 1.02 | 0.2 | 0.92 | -0.2 | 0.54 |
| Activities that focus on improving the organization as a whole | SP1 | -0.82 | 0.24 | 0.80 | -1.9 | 0.74 | -1.0 | 0.62 |
| Incorporates best practices into our operations | MF1 | -0.93 | 0.24 | 1.01 | 0.2 | 1.08 | 0.4 | 0.55 |
| Has a strong future orientation | F2 | -0.96 | 0.24 | 1.09 | 0.8 | 1.02 | 0.1 | 0.53 |
| Eliminates adverse impacts on our stakeholders (i.e., customers, patients, employees, suppliers, the public, and the community) | FR1+ | -1.10 | 0.23 | 1.02 | 0.2 | 0.93 | -0.2 | 0.57 |
| Emphasizes the sharing of knowledge throughout the organization | OPL2+ | -1.47 | 0.23 | 0.99 | -0.1 | 0.91 | -0.4 | 0.61 |
| Resolves complaints by "making things right" for our customers or patients | PFE3 | -1.52 | 0.24 | 1.12 | 1.1 | 1.11 | 0.6 | 0.56 |
| Develops a long-term commitment to our stakeholders (i.e., customers, patients, employees, suppliers, the public, and the community) | F1 | -1.52 | 0.23 | 0.87 | -1.3 | 0.89 | -0.5 | 0.65 |
| Develops strategies with a customer or patient focus | VL2 | -1.63 | 0.23 | 0.96 | -0.3 | 0.87 | -0.6 | 0.63 |

**Table 2** Summary of major characteristics of case companies (continued).

| Core value items | Core value | Measure | SE | Infit | ZSTD | Outfit | ZSTD | $r_{pm}$ |
|---|---|---|---|---|---|---|---|---|
| Provides employees with opportunities for personal learning through education, training, and other means for continuing growth | OPL1 | -1.74 | 0.23 | 1.18 | 1.7 | 1.40 | 1.8 | 0.54 |
| Is concerned with employee satisfaction and well-being | VW1 | -1.79 | 0.23 | 1.05 | 0.5 | 1.09 | 0.5 | 0.60 |
| Encourages employees to contribute to the organization | VL1 | -1.80 | 0.24 | 1.12 | 1.1 | 1.23 | 1.1 | 0.57 |
| Customer or patient satisfaction and retention | PFE2 | -2.21 | 0.24 | 1.02 | 0.2 | 0.93 | -0.2 | 0.64 |
| Ethical behavior in all stakeholder relations | SR1 | -2.21 | 0.25 | 1.15 | 1.3 | 1.17 | 0.8 | 0.59 |
| Strives to improve our products or services | PFE1 | -3.48 | 0.28 | 1.23 | 1.4 | 1.27 | 0.8 | 0.61 |
| **Excluded core value items** | **Core value** | **Measure** | **SE** | **Infit** | **ZSTD** | **Outfit** | **ZSTD** | $r_{pm}$ |
| Uses cross-functional learning such as job rotation | OPL | 1.42 | 0.38 | 1.10 | 0.5 | 1.87 | 1.00 | 0.25 |
| Serve as role models for others | VL | -0.52 | 0.25 | 1.15 | 1.2 | 1.71 | 1.9 | 0.45 |
| Makes use of on-the-job-training | OPL | -0.45 | 0.26 | 1.03 | 0.3 | 1.62 | 1.6 | 0.48 |
| Innovation that builds upon existing knowledge | MI | 0.82 | 0.32 | 0.77 | -1.2 | 0.37 | -1.0 | 0.47 |
| Develops a culture for innovation | MI | 1.44 | 0.38 | 0.88 | -0.4 | 0.39 | -0.6 | 0.38 |
| Simplifies work and work processes | A | 3.96 | 1.02 | 1.03 | 0.4 | 0.33 | 0.8 | 0.12 |

\* Denotes a core value item that is more difficult for a non-award-winning Minnesota hospitals to accomplish.
+ Denotes a core value item that is easier for a non-award-winning Minnesota hospitals to accomplish.

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mean square fit statistic to reduce the undue influence of outlier responses (Wright and Masters 1982). The mean square statistics and the z-scores are all reported in Table 2. Five of the variables did not meet the dual criteria used in this study. Consequently, these variables were removed from the analysis. The remaining 58 variables comprise the final model, which calibrates to the Rasch model expectations.

The third phase of the analysis provides a confirmation that no other significant dimension exists to provide an alternate explanation, other than the Rasch dimension. To ensure no competing explanation exists, a principal components analysis of Rasch standardized residuals is undertaken. In the context of RMA, principal components analysis examines the explained variance of the Rasch dimension vis-à-vis other competing explanations. In this analysis, the variance explained by the measures was 75.5 percent, while the unexplained variance in the first contrast was 1.6 percent. When the variance explained by the measures (the Rasch dimension) is > 60 percent

and the unexplained variance in the first contrast (a competing or alternate explanation) is < 5 percent, then a satisfactory explanatory model is deemed to exist (Linacre 2006). Thus, no apparent competing explanation appears to exist.

The final aspect of this analysis views the reliability of the model. That is, is one able to construct an internally consistent measure? RMA is able to separately measure hospitals and core value items. The Rasch reliability for hospitals is 0.85, which can be interpreted as a Cronbach $\alpha$ of 0.91, and the Rasch reliability for the core value items is 0.94. The level of reliability present in this analysis indicates the presence of an internally consistent measure.

Based upon the results of the Rasch model analysis, two basic conclusions can be drawn. First, the questionnaire on core values used in this study is a valid and reliable measuring instrument. Second, a unidimensional latent variable that is composed of the core value items defines the concept of performance excellence.