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Hospital Quality Assurance and Outcomes of Hospitalization

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Abstract

HOSPITAL QUALITY ASSURANCE AND

ADVERSE OUTCOMES OF HOSPITALIZATION

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This study was undertaken to address the need of professionals responsible for assuring the quality of hospital care for a framework for understanding and evaluating quality assurance mechanisms and their impact on hospital quality of care. Primary data were collected from 70 Virginia short term acute care general hospitals on the design and resources of their quality assurance programs in 1986. Adverse outcome data for 1986 were collected from the Medical Society of Virginia Review Organization. Hospital structural data were obtained from the American Hospital Association computer data base and the Federal Register. The intermediate outcome variables are: rate of unexpected return to the operating room, rate of treatment/medication problems, rate of in-hospital trauma, rate of medical instability at discharge, and rate of unexpected deaths.

Exploratory analyses of hospital size and specialization demonstrate that size positively affects the numbers of RNs in

quality assurance, the number of quality assurance professionals with academic degrees above the associate level, and negatively affect the ratio of quality assurance personnel full-time equivalents (FTEs) - both total and professional - to total hospital FTEs. Hospital specialization negatively affects the ratio of quality assurance personnel FTEs - both total and professional - to total hospital FTEs.

Structural equation models, causally relating the adequacy of quality assurance design and resources to adverse outcomes of hospitalization, were used to test the causal relationships. The model supports the work of Donabedian and of Deming. The model demonstrates the effects of quality assurance constructs on perceived organizational commitment to quality assurance and commitments effect on process-related outcomes. Process-related outcomes are strongly and positively related to the terminal measure of unexpected deaths.

When size and specialization are controlled, some changes are noted in the model. The R^2 increases, the Chi-square/df ratio increases and the adjusted goodness of fit ratio decreases. This change was not unexpected due to the statistical significance of the percent of board certified physicians (BRDCERT) on the outcome variable unexpected death (DEDPROBR).

CHAPTER 1

INTRODUCTION

"We Americans hold this truth to be self-evident: Our health-care system is the best in the world" (Reinhart, 1986, p. 101). As Uwe Reinhart then enumerates, there is much evidence to sustain that claim. The United States has more than enough hospital beds to meet needs; a highly educated cadre of health care providers; and a supply of sophisticated technology second to none. In addition, our health care research community has and continues to lead the world in biomedical research and innovation. The question arises though as to whether that assessment holds true not only in today's turbulent environment but will hold true in the future.

This nation has functioned since the middle of this century upon the often implicit assumption that health care is a right of all Americans and should thus be available to all. This philosophy has had a great impact on national policy as the federal government has spent billions of dollars on health manpower training, health care financing and delivery programs, health care quality review programs,

and basic biomedical research. The nation accepted the financial outlay for these programs without complaint until the 1970s. In the early 1970s, people began to complain that health care costs too much for what was received (Durenberger, 1986, p. 8). Indeed, America was beginning to confront the possibility that financial resources were limited and we could no longer have everything we wanted. We would have to make choices among programs to address needs in housing, defense, agriculture, transportation, energy, health care, law enforcement, and a hundred other areas, and we were not accustomed to that.

In 1970, when President Nixon signaled the onset of the crisis in health care expenditures, the nation's total outlays amounted to $75.0 billion, or 7.6% of the gross national product (GNP), up from $26.9 billion and 5.3% a decade earlier (Ginzberg, 1985, p. 272). The health expenditure bill for 1980 was $248.1 billion or 9.1% of the GNP and for 1986 $458.2 billion or 10.9% of the GNP. It is projected that the 1990 bill will be 12% of the GNP or approximately $647.3 billion (HCFA, 1987, p. 24). This astonishing climb in the percent of our gross national product consumed by health care expenditures is graphic evidence of one portion of the economy out of control. To emphasize even further the question of the value obtained by these expenditures, international epidemiological statistics showed the United States as having fallen behind other

nations in progress in decreasing infant mortality rates, cancer and cardiovascular death rates, and increasing life expectancy for both males and females (Kotelchuck, 1976, p. 5-30).

Critics of the health care system raised images of an inefficient system driven by the open-ended federal pocketbook. Retrospective fee-for-service financing of care was targeted as a major cause of out-of-control health care costs. As a result of these concerns, the Tax Equity and Fiscal Responsibility Act (TEFRA) of 1982 and the Social Security Amendments of 1983 mandated that beginning October of 1983, the federal government phase-in a prospective payment system (PPS) of Medicare reimbursement (Levine and Abdellah, 1984, p. 105), which, in reality, was to drastically change the United States health care financing system. PPS, based upon the diagnosis-related groupings (DRG) system, was designed to place incentives on the provider to deliver health care in as efficient a manner as possible, for they received a fixed payment per patient calculated prospectively based upon the patient's DRG (Eggers, 1987, p. 29).

This emphasis on efficiency immediately challenged the unspoken but prevalent health care philosophy that "the more, the better" is the way to delivering quality health care. Critics of the PPS alleged that the system would result in declining quality of care and a two-tiered health

care system. Among the fears were that hospitals would prematurely discharge patients when their DRG payment was "used up," thus placing the patient back into the community when she/he was too ill; hospitals might refuse to care for certain patients based upon their ability to pay and/or principal diagnosis; the availability of certain services would become scarce due to the low profit margin typical of certain DRGs; hospitals might go bankrupt and close; and access to care would be impacted.

Although some of the situations anticipated prior to the implementation of PPS have occurred, none has proven to be widespread nor catastrophic to the health care system. The federal government has promulgated regulations and enacted legislation to refine the PPS and address the undesired and unintentional outcomes of the policy. The refinement of the system continues, but concerns about the quality of care delivered under the PPS remain unanswered.

Quality of care concerns are not new or entirely related to PPS. In 1972, Professional Standards Review Organizations (PSROs) were established with the goal of reviewing hospital utilization for quality and appropriateness. The PSRO's role was to review hospital use paid for under Medicare, Medicaid, and Maternal and Child Health programs; to identify unnecessary treatment; and the general assurance of quality of care through selective chart review and auditing (Brown, 1979). PSROs have now been

replaced by Peer Review Organizations (PROs) to monitor hospital use under the PPS.

As the federal government was mandating the establishment of PSROs, the courts began to recognize health care providers' rights to due process, resulting in the need for formalized quality assurance activities rather than the previous informal ad hoc committee structure common in most hospitals. This move toward formalized quality assurance activities culminated in 1980 with the Joint Commission on Accreditation of Hospitals, for the first time, promulgating regulations for quality assurance standards in its Accreditation Manual for Hospitals, 1980 (Richards and Rathbun, 1983, p. 52). Although quality of care concerns have resulted in formalized mechanisms for quality assessment, no solutions have been formulated to answer questions pertaining to: (1) what constitutes quality care; (2) how it should be measured; and (3) what the determinants of quality of care are.

Quality of Care Conceptual and Measurement Issues

The conceptual and measurement issues surrounding the measurement of quality of care are complex. The technical aspects of care have generally been accepted as the most important aspect of hospital care. Yet the technical aspects of care are, in many ways, deceivingly complex. In many areas of care, there is general agreement about the necessary components of care. For example, appendicitis

requires an appendectomy; management of diabetes requires that blood and urine sugar measurements be made routinely and adjustment of hyperglycemic agents be made as required; and frank fetal distress during labor requires immediate delivery of the fetus/infant. Yet, there are many areas of care where there is little agreement regarding management. For example, the treatment of breast cancer ranges from lumpectomy to radical mastectomy, from radiation to chemotherapy to no adjunct therapy or to various combinations of therapies. Treatment of coronary artery disease has equally perplexing alternatives, as does the treatment of gall bladder disease (cholecystitis/ cholelithesis), to name just a few.

Amplifying the complexity of the problem of evaluating technical care is the fact that medical science does not understand much of what goes on in diseased states. Therefore, it is difficult, if not impossible, to attribute variations in the well-being of an individual patient solely to the care provided.

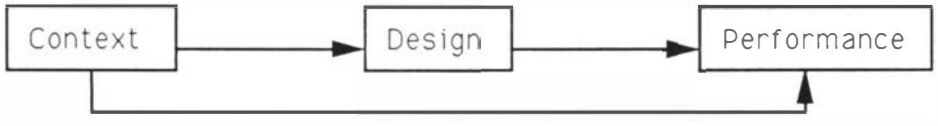
The interpersonal aspects of patient care are probably the most neglected areas of investigation in relation to quality care simply because care providers rarely document those aspects of the care process. The exception is the care provider who is treating a psychological abnormality or referring the patient to another provider for assistance with a major social problem. In addition, "the management

of the interpersonal relationship is an 'art' mainly by default, because its scientific foundations are relatively weak, and because even the little that is scientifically known is seldom taught" (Donabedian, 1980, p. 4). The "routine" interpersonal interactions between provider and patient are rarely documented and, thus, unavailable to researchers.

Although much emphasis is placed upon the patient-based areas of technical and interpersonal care, most individuals involved with the hospital-based care of patients would acknowledge that the organizational structure within which care is provided affects the caregivers and their ability to provide care. On the other hand, others would argue that the economic aspects of health care, along with the characteristics of the organization's catchment area and population (context) will impact care through their influence on organizational design (Figure 1). Each of these perspectives raises concerns regarding the measurement of quality and poses real dilemmas about the level at which quality of care should and can be measured.

Not only is there a concept called quality of care which is not universally defined, but there is limited agreement regarding what contributes to care and at what level--individual, organizational, or system--quality should be measured. Underlying these dilemmas are the problems related to the limited understanding health care providers

Figure 1. The relationship among an organization's context, design, and performance.



Source: Kaluzny and Veney, 1980, p.32.

have regarding what impacts on an individual's well-being. These problems present difficulties in specifying a research model, choosing an appropriate methodology, and interpreting results.

Although quality of care is a commonly used term in health services research, much research addresses only a portion of that concept. Table 1 lists indicators representing the concept of quality of care incorporating individual, organizational, and system indicators of quality. This approach of including individual and community attributes along with organizational characteristics is termed an integrated perspective. This perspective is believed to enhance our understanding of the hospital's performance. It becomes clear very quickly that to comprehensively measure quality of care, enormous quantities of data would be required. Due to limitations in time, of money, and of available data, most research measures only selected indicators. These usually fall into one of four major areas - adverse outcomes, patient satisfaction, economic issues, or access. This research project will utilize adverse outcomes as its measure of quality of care. The term adverse outcome is used because it more accurately and clearly describes the aspect of quality of care being studied.

Adverse outcomes are chosen as the measures to be used to study quality of care for several reasons. First, from a

TABLE 1 The concept of care: an integrated perspective

Concepts of Quality of Care	Indicators: Individual	Indicators: Organizational	Indicators: Systemic
Structure	Patient's type of health insurance	Hospital ownership	Number of hospital beds nationally
Process	Patient satisfaction with interpersonal aspects of care	Patterns of surgical rates by procedure	Rate of black patients lost to follow-up following diagnosis of lung cancer
Outcome	Mortality	Hospital mortality rates	Average life expectancy

data standpoint, they are the outcomes which are most consistently monitored and recorded. Second, they are undesired outcomes of both the treatment process and the organizational setting. For the most part, they are preventable and avoidable events when the system is functioning properly. Third, adverse outcomes can be related to care provided by numerous health care workers. Therefore, more than one aspect of the care process can be assessed within this one area.

Adequacy of Care and Service Intensity Demands

Although adverse outcomes is a concept describing one aspect of quality of care, it is a concept supported by other underlying concepts. Service intensity demands and adequacy of care are but two of these underlying concepts.

Adequacy of care is a concept addressing the hospital's delivery of care to patients in a safe and appropriate manner. It is in essence a measure of intermediate outcomes of patient care, measured at the hospital level. As noted previously, undesired byproducts or outcomes of hospitalization are routinely monitored; therefore, researchers have examined many of these areas. Extensive research on nosocomial infections (Gross, et al., 1980; Farber, Kaiser, and Wenzel, 1981; Gross, et al., 1983; Haley, et al., 1985; Wenzel, 1985), post-operative complications (Flood, et al., 1979; Couch, et al., 1981; Hobler, et al., 1984; Hughes, et al., 1987), readmissions to

hospital (Anderson and Steinberg, 1984; Roos, 1984; Roos, et al., 1985), outliers (Hughes, et al., 1987), mortality (Flood, et al., 1979; Luft, 1980; Hobler, et al., 1984; Roos, 1984; Kraus, et al., 1986; Kelly and Hellinger, 1986; Hughes, et al., 1987; Dubois, et al., 1987; Goldfarb and Coffey, 1987; Shortell and Hughes, 1988), hospital's surgical volume (Flood and Scott, 1978; Anderson and Steinberg, 1984; Roos, 1984; Roos, et al., 1986; Goldfarb and Coffey, 1987), age of patients (Anderson and Steinberg, 1984; Hobler, et al., 1984; Kelly and Hellinger, 1986; Dubois, et al., 1987; Shortell and Hughes, 1988), the percent of male patients (Anderson and Steinberg, 1984; Roos, 1984), and length of stay (Flood, et al., 1979; Hobler, et al., 1984; Goldfarb and Coffey, 1987; Hughes, et al., 1987; Dubois, et al., 1987) have been conducted. Certain characteristics of patients, such as advanced age (Anderson and Steinberg, 1984; Hobler, et al., 1984; Kelly and Hellinger, 1986; and Shortell and Hughes, 1988) and comorbidity (Hobler, et al., 1984; Kelly and Hellinger, 1986; Roos, et al., 1986; and Shortell and Hughes, 1988) have been shown to be related to increased adverse outcomes. From an intuitive approach, this would be expected. The elderly are more fragile physiologically and, perhaps, somewhat limited in mobility and dexterity, and the chronically ill often have complex medical and nursing management problems which may contribute to adverse outcomes

if the quality of care received by these patients is lacking.

Although there are other underlying concepts which might be addressed, adequacy of care and service intensity demands are considered, in this research, to be of primary importance because they encompass the scope of hospital care and its delivery. As will be discussed in the literature review, the quality of research cited in this discussion varies greatly. Yet, a great deal of progress has been made in identifying predictors of quality of care and in trying to understand their impact on quality.

Many quality of care questions remain unanswered mainly because of the difficulty in obtaining agreement on the definition of quality of care, the methodological problems found in most quality of care research, and the costs of collecting patient-level data. Policy makers are concerned about the effectiveness and efficiency of the entire health care system, and thus need the ability to differentiate acceptable from unacceptable quality of care among both individual and organizational providers, utilizing readily accessible data, which provides valid and reliable results. From a policy perspective, it is also imperative to know the impact of quality assurance mechanisms on the quality of care delivered by the hospital.

Donabedian's Quality Assessment Framework

The conceptualization of quality of care is complicated

not only by a paucity of understanding regarding the various influences which affect the well-being of the patient, but by a basic lack of agreement about what should be included in describing the dimensions of quality of care. Although much research has been done on quality of health care, it is not unusual to find that the results of one study may contradict those in another study. Evaluation of the empirical studies shows a variety of research designs, definitions of terms, operationalization of terms, and a vast range in comprehensiveness of the research questions. This lack of consistency in research severely limits the comparability as well as the generalizability of findings.

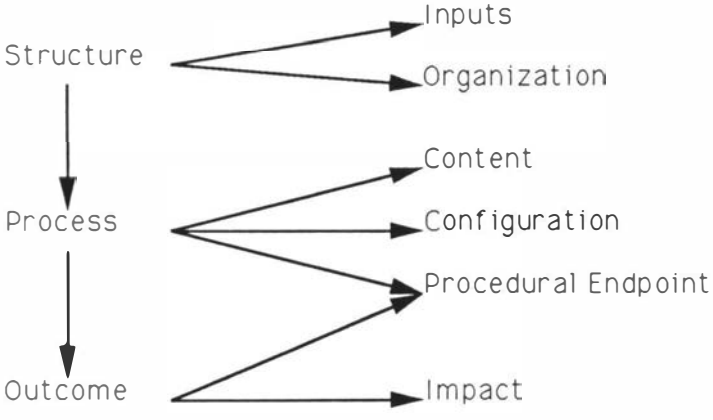
Some progress has been made in finding a common framework for quality assessment since Avedis Donabedian proposed an assessment framework in 1966. Most contemporary quality of care researchers have adopted his general framework, thus facilitating the dialogue among researchers and helping to move the field forward.

Avedis Donabedian (1980) has proposed a framework for assessing and a definition of quality of care. Donabedian (1980) defines quality of care as "that kind of care which is expected to maximize an inclusive measure of patient welfare ..." (p. 6). This definition reflects his conceptualization of quality of care as the type of care which attempts to obtain the best level of well-being possible for the individual. Consideration should be given

to all aspects of the individual including individual wishes or desires, physical and mental potential and needs, family needs and limitations, financial needs, and spiritual needs.

Donabedian (1980) suggests three major elements of the formulation of quality assessment approaches. The first of these is structure. Structure is defined as "the relatively stable characteristics of the providers of care, of the tools and resources they have at their disposal, and of the physical and organizational settings in which they work." (p. 81). As is evident from this definition, structure includes both the inputs to and organization of the care process. The second element is the process of care. It is defined as "... a set of activities that go on within and between practitioners and patients." (p. 79). Process includes the content of care, which are the discrete activities which go into care, and the configuration of care, which is the organization of the care activities (p. 87). Outcome is the final element Donabedian identifies. It is defined as "... a change in a patient's current and future health status that can be attributed to antecedent health care" (pp. 82-83). Spanning two elements--process and outcome--is procedural end point, a plan for patient management or diagnosis. As procedural end point deals with aspects of planned patient management, impact deals with the end result of the process of care. Figure 2 illustrates the formulation of assessment Donabedian (1980, p. 90) has

Figure 2. Donabedian's formulation of an approach to quality assessment.



Source: Donabedian, 1980, p. 90.

advanced.

Donabedian's framework offers this research a framework common to much of the contemporary quality of care research. It also is an approach which takes into account the holistic nature of the provision of hospital care by including structure, process, and outcome. This research views structure of the hospital and quality assurance mechanism and quality assurance functioning (process) as impacting adverse outcomes of hospitalization. This conceptualization lends itself nicely to the approach offered by Donabedian.

Donabedian emphasizes in his work the interrelatedness of the various elements of his formulation and the normative basis for the evaluation of quality. His emphases reiterate the complexity of the task of assessing the quality of care.

Quality Assurance and Adverse Outcomes of Hospitalization

As the government and the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) have tried to ensure the quality of care provided by hospitals, they have mandated that there be organizational subunits in each hospital to monitor the effectiveness of the organization. These subunits are quality assurance mechanisms. Where quality assessment focuses on monitoring, quality assurance goes beyond just monitoring to include prevention and correction of unacceptable deviations. JCAHO's requirement of quality assurance mechanisms is reflected by its expanded emphases on measuring all aspects of the hospital's

functioning. Although early JCAHO standards focused mainly on structure, the more current ones include structure, process, and outcome measures. The requirement that the care provided by a hospital and its staff--both professional and nonprofessional--be evaluated raises many issues when evaluation is attempted.

Several issues arise which impact on the function of hospital quality assurance mechanisms. First, it becomes evident that a hospital is in reality two organizations--the hospital organization and the medical staff organization. The hospital staff consists of professional and nonprofessional staff who provide and support the provision of care to patients. The medical staff consists of providers who, for the most part, are not employees of the hospital but use the hospital and its staff in the provision of care to patients. These two organizations have different goals and objectives.

Second, the requirement for monitoring quality of care forces the intrusion of the organization into the heretofore sacrosanct realm of the professional--physician, nurse, physical therapist, etc. From the perspective of the professional, the practice of their profession is open to criticism only by peers. In addition, many would maintain that the variations characterizing the process of caring for sick patients virtually prohibit standard setting or rule making. In essence, the requirement for quality assurance

mechanisms poses a dilemma over how to monitor and control professional practice.

Third, the nature of the patient's physiological and psychological responses to the technology applied in the care process can prove to be unpredictable and poorly analyzable thus making causal links with outcomes very difficult.

Fourth, patient traits, behaviors, and socio-cultural characteristics can interfere with the effectiveness of the treatment, thus distorting the effectiveness of that treatment.

Finally, the achievement of commitment by the entire organization to the fulfillment of quality care goals is difficult considering the varying needs and goals of the multitude of professional and nonprofessional providers and workers involved in the care process and its support services.

Quality assurance mechanisms are structured ostensibly to further the goals of the organization to assess the delivery of care and its efficacy, thereby improving the quality of care provided by the hospital. The structure of quality assurance mechanisms is reflected in the extent of formalization, specialization, standardization, decentralization, complexity, and professionalism, and the characteristics of hierarchy of control and personnel configuration. These structural characteristics are adjusted

in light of the product to be evaluated and the groups to be controlled, in order to facilitate the flow of information needed by providers and management to maintain or improve the quality of care delivered. The contextual dimensions of size, technology, and environment should also impact on the quality assurance mechanism's organizational form. Therefore, the design of quality assurance mechanisms should reflect the organization's commitment to quality assurance, appropriate control mechanisms, and the context in which the quality assurance subunit is located. Thus, structural and process measures of the quality assurance mechanism's design are expected to have an impact on adverse outcomes.

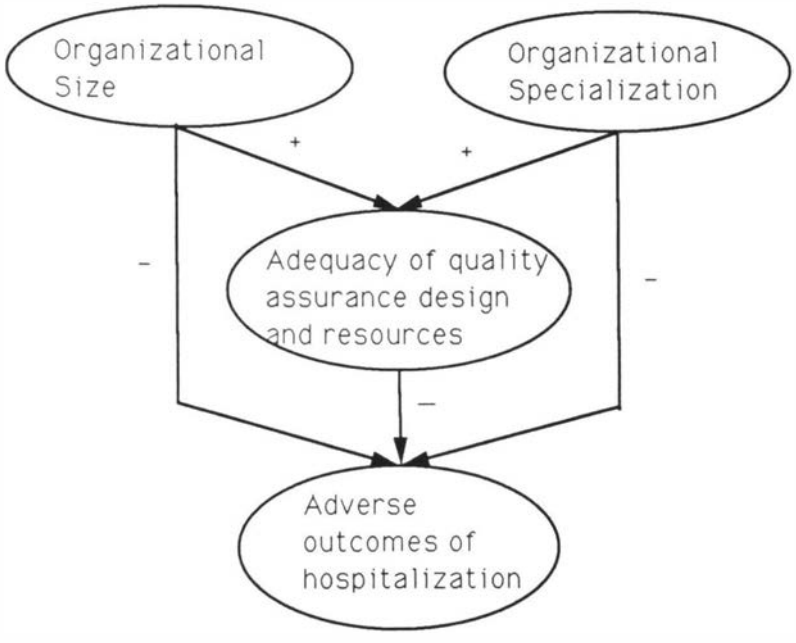
The adequacy of quality assurance design and resources is an underlying concept which encompasses the extent of organizational commitment of resources and the degree of organizational control over the quality assurance subunit. Such variables as perceived organizational commitment (Deming, 1982; Sanazaro and Worth, 1978), adequacy of resources (Knaus, et al., 1986), and appropriateness of control mechanisms (Shortell and LoGerfo, 1981; Child, 1973; Ouchi, 1977; Glisson, 1978; Knaus, et al., 1986) help measure this concept. In addition, research by Child (1973), Shortell and Becker and Neuhauser (1976), Ouchi (1977), Glisson (1978), Peterson (1984), and Knaus, et al. (1986) have demonstrated that such organizational dimensions as formalization, specialization, standardization,

complexity, hierarchy of control and personnel configuration (Daft, 1988), describe the design of the organizational subunit and impact performance.

As the adequacy of quality assurance design and resources influences adverse outcomes, so it is influenced by the size of the organization and its degree of specialization (Figure 3). Extensive organizational research has shown that size influences the structural and functional needs of an organization. Size can be measured many ways among which are the number of hospital beds, capital expenditures, and number of employees.

Influenced by size and also influencing it, as well as directly influencing adverse outcomes, is specialization (Figure 3). The specialization of the organization is its division into areas of expertise, or, as Daft (1983) defines it, "the degree to which organizational tasks are subdivided." (p. 17). For instance, such variables as the presence of intensive care units (Hughes, et al., 1987), the presence of different types of disease or body system-specific patient units (Hughes, et al., 1987), the availability of high technology (Knaus, et al., 1986), and the provider personnel mix (Roos, et al., 1986; Shortell and Hughes, 1988; Kelly and Hellinger, 1986), represent areas of specialization and their measurement. The research in these areas is extensive and supports the importance of such variables.

Figure 3. The relationship among variables relating to hospital context, quality assurance design and resources, and adverse outcomes of hospitalization.



This research views the quality assurance subunit as being influenced by the context in which it functions--the hospital. It is also thought that the adequacy of the design and resources of the quality assurance subunit will influence the performance measure of this study--adverse outcomes.

Research Questions

This research is undertaken to address the need of professionals responsible for assuring the quality of hospital care for a framework for understanding and evaluating quality assurance mechanisms and their impact on hospital quality of care. The purpose of this study is to explore the relationships among hospital quality assurance mechanisms, organizational context, and adverse outcomes of hospitalization.

This purpose raises several research questions:

1) How does the organization's context affect quality assurance structure and resources?

2) How do quality assurance structure and resources affect adverse outcomes of hospitalization?

3) How does the organization's context affect adverse outcomes of hospitalization?

Significance of Research

Previous research on hospital quality of care has been flawed by using unreliable and invalid measures of quality. For instance, hospital mortality rate, the most commonly

used measure of quality, is an exceedingly blunt measure of hospital quality of care. Mortality as a sole measure of quality reflects mainly extreme variations in quality of care. A useful and meaningful measure must be more sensitive to subtle fluctuations in quality if it is to be used for monitoring. Research that attempts to develop a multiple indicator model of hospital quality of care can broaden the concept of care delivered by the hospital and, theoretically, will improve the integrity of the measurement. The inclusion of multiple data sources including peer review data will capture multiple domains of hospital care under the purview of all major provider groups within the hospital, as well as some services rendered by support services. The multiple indicator model offers the prospect of developing a more sensitive measure of quality by taking into account variables representing the influences of many sources of care.

This research also begins to explore quality assurance activities' structure and resources and their impact on adverse outcomes of hospitalization, which is essentially an untouched area of health services research. Exploring the effect of quality assurance activity and the structure of such activity addresses the impact of the activity, utilized both on the organizational and system level, intended and assumed to assure quality of care. This research attempts to explore the accuracy of such suppositions at a time when

the results of quality assurance activities are of great concern.

The timeliness of this research is of great significance. Concerns regarding the quality of hospital care remain after five years under the phased-in Prospective Payment System. With increasing pressures on government to control health care costs and on hospitals to provide quality care with less money, a perceived need to have a method of monitoring the quality of care at a reasonable cost in both time and money is felt by individuals and agencies charged with assuring that the quality of hospital care be maintained. This research offers an approach to measuring adverse outcomes of hospitalization utilizing multiple data sets obtained from the Medical Society of Virginia Review Organization, the American Hospital Association and the Area Resource File. In addition, a survey of hospital quality assurance activities in Virginia was conducted. From a cost perspective--both time and money--such an approach is of great interest. If a monitoring approach can be formulated to account for a significant variation in quality, it could result in significant time and financial savings. The savings would be accomplished by decreasing the size of the sample needed for intensive review and by increasing both the sensitivity and specificity of the method used for monitoring hospitals. The end result could be greater financial savings and

greater confidence in the quality of care delivered by hospitals. From a public policy perspective, it could also mean that appropriate adjustment in policy can occur before major problems arise.

Limitations

There are at least two basic limitations of this research. First, aggregation of patient-level data to the hospital level can mask intrahospital variation in quality of care. Second, the study is limited to hospitals located in a single state. Information generated from the small sample size may, therefore, limit the generalizability of the findings.

Summary

This research is designed to explain the relationship of hospital quality assurance mechanisms and organizational context to the adverse outcomes of hospitalization. The theoretical framework for this research is based on a contingency perspective incorporating Donabedian's framework of quality of care assessment. Contextual variables of hospital size and specialization are thought to affect the design of the quality assurance mechanism and the extent of resources allocated to it as a result of the needs of a differentiated organizational structure to control performance. Quality assurance mechanisms are thought to affect adverse outcomes through the mechanism's ability to effectively control professional practice by facilitating

the provision of appropriate information and data to providers. The research addresses the critical need for monitoring the quality of care delivered by hospitals in an increasingly competitive and restrictive health care environment. The proposed approach to modeling the measurement of quality of hospital care within an organization research framework is unique and timely.

The investigation of a causal relationship between quality assurance activities and adverse outcomes of hospital care will yield useful managerial information to strengthen further quality assurance programs. This research offers a pragmatic approach to addressing a significant health care management issue in the turbulent and competitive health care environment of 1990.

CHAPTER 2

CONCEPTUAL FRAMEWORK

The theoretical framework which has been chosen for this research is the contingency perspective. This perspective is based upon the dual premises that there is no one best way to structure an organization, but some ways are better than others (Galbraith, 1973). This open systems approach theorizes that the organization's size, its technology, and its environment influence the organizational design which could optimize organizational effectiveness (Shortell and Kaluzny, 1983, p. 345).

The contingency perspective, as a holistic approach, recognizes the effects of both inter- and intra-organizational factors on performance. Secondly, it allows for managerial responses to pressures which affect the various components of the organization. This research assumes that hospitals structure their organization in a way to optimize the quality of care provided, in light of their other organizational goals. Alternately, if the structure is not appropriate for the specific organization, then one would expect to find that the deficient quality assurance

structure will impair organizational effectiveness in monitoring quality of care. Consequently, one would find an increase in the number of incidents of adverse outcomes. Daft (1989) has proposed a framework for evaluating and describing organizations' contexts and structures. This framework is used in this study to describe the various dimensions of the hospital and the quality assurance mechanism.

An Organizational Evaluation Framework

As previously stated, organizations are open systems influenced not only by various components within the organization, but also by the environment in which the organization itself exists. Contextual and structural dimensions of an organization help describe the organization and its environment.

Contextual dimensions of an organization characterize the whole organization and its environment. They would include organizational size, technology, and environment. These dimensions help describe organizations and allow for comparisons among them. Size can be measured in a variety of ways, one being the number of people in the organization. Organizational technology refers to "the nature of the task in the production subsystem, and includes the actions, knowledge, and techniques used to change inputs into outputs" (Daft, 1983, p. 17). The environment is everything exterior to the organization.

Structural dimensions describe the internal characteristics of an organization. Eight dimensions of organizational structure are formalization, specialization, standardization, hierarchy of authority, centralization, complexity, professionalism, and personnel ratios (Daft, 1989, p. 18).

Formalization pertains to the amount of written material/documentation in the organization, while specialization is the extent to which tasks are subdivided. Standardization refers to the extent that similar activities are performed in a uniform manner, and hierarchy of authority describes the reporting chain of command and managerial span of control. Centralization refers to the hierarchial level that has decision making authority; and complexity is the number of subsystems within the organization. Professionalism describes the level of employee training and formal education. Personnel configuration describes the deployment of people to various functions and departments (Daft, 1989, pp. 17-18, 20).

These eleven dimensions are measurable aspects which can be used to analyze and compare organizations. They, in essence, draw a picture of the organization and its subunits. Although the organization may demonstrate a certain level of each dimension, it is not unusual for organizational subunits to vary in the degree a structural dimension is employed. Therefore, the contingency

perspective, utilizing Daft's framework, permits the description of each hospital's structure, including the quality assurance structure, and context.

The contingency perspective's dual premises that there is no one best way to structure an organization, but some ways of structuring are better than others, has led to the development, through empirical research, of general guidelines for structuring. As an organization's size increases; if its technology is more routine, and analyzable; if its personnel are not highly professionalized; and if the organization's environment is relatively stable, the organization tends toward a more bureaucratic structure. Where an organization is smaller; its technology less routine and analyzable; its personnel highly professionalized; and its organizational environment unstable, a more organic structure is more appropriate. Few organizations fit neatly into these two categories; therefore, organizational structure varies along a continuum from bureaucratic to organic. Subunits may also vary among themselves, in contrast to the overall organizational structure. For instance, a hospital's housekeeping unit would most likely be bureaucratic in structure, while the physical therapy department could be more organic. Although hospitals may possess many of the characteristics of most complex organizations, they are a somewhat unusual organizational form.

The Hospital As A Unique Organization

The typical short-term acute care hospital in the United States is characterized by a dual line of authority, numerous levels of health care professionals (both as employees and as non-employees), various levels of professionalization among workers, and great disparity among worker groups in their power and influence within the hospital. As would be expected, this great diversity of worker groups results in a diversity of goals which may or may not be congruent with those of the hospital organization itself. To further complicate matters, the more professionalized workers may not only feel limited allegiance to the organization itself, but also resist management's attempt to enforce adherence to organizational goals, procedures and standards (Raelin, 1985, pp. 147-75).

The hospital is characterized by a structure headed by a hospital Board of Directors (Board) which governs the hospital and its employees through delegated responsibility to hospital administration for implementation of policy. A parallel structure consisting of physicians with privileges at the hospital, termed the Medical Staff, governs itself, with delegated responsibilities from the Board. This is, as Harvey Smith coined the phrase, the "dual line of authority" in hospitals (Smith, 1955, p. 59). Legal rulings since Smith coined the phrase have altered the relationship between the Board and the Medical Staff. The hospital Board

of Directors has gained much greater responsibility for and authority over the Medical Staff (Darling v. Charleston Community Hospital, 33 Ill. 2d 326, 211 N.E.2d 253 [Ill. 1965]) and has been held through a number of rulings (Darling v. Charleston Community Memorial Hospital; Gonzales v. Nork; Elam v. College Park Hospital; Jackson v. Power; Polischeck v. United States; Leavitt v. St. Tammany Parish Hospital; and Krueger v. St. Joseph Hospital) to be responsible for having "quality-controlled institutions," rather than just structures in which physicians practice (Peters and Olkowski, 1989, p. 31). The physicians, as entrepreneurs, utilize the facilities and personnel provided by the hospital to deliver care to their patients. For the most part, they are not employees of the hospital but, with the hospital, provide care to patients. This joining of efforts to provide the service of health care brings about the need for cooperation in an effort to ensure that the two groups of providers--the hospital and the health care professionals--can provide quality health care. Not only does the law place responsibility on both groups for the delivery of safe care, but the codes of ethics of the involved professions place responsibility on the individual professional.

Health Care Services Technology

Organizational theorists have discussed extensively the nature of the technology involved in the production process

(Flood and Scott, 1987; Glisson, 1978; Ouchi, 1977). In a tin can factory, the nature of the production process is well understood. The technology is clear-cut, the nature of the task is predictable and the output is easily measured. This example is in contrast to the provision of health care delivered by a hospital. Not only is the production process--the provision of care--not well understood, but the output--the patient's well-being/condition--is not easily measured or understood. In providing health care, many variables relating to the organization, the patient, and aspects of the patient's life and environment can play a part in the effectiveness of the care delivered. This, along with the recognized inexactness of much of the scientific portion of medical care (Donabedian, 1980) make the production of health care and the measurement of its effectiveness very tenuous at best.

Organizational Control

In an organization where the work is highly analyzable, the tasks fairly simple, and the uncertainty of the environment low, measuring and controlling the effectiveness of the production process are relatively straightforward. For example, in the tin can factory the process of producing a can is well understood, and the desired output is easily measured. In contrast, the hospital's product--health care--is at the most, poorly understood, very difficult to measure, except at the extremes--cure or death--and subject

to multiple influences from both within and outside of the process of care.

These differences in the certainty of the production process impact the effectiveness of measurement of that process and how to control it. If the production process is understood and the output easily measured, either output or behavior controls can be used, such as in the tin can factory. If the production process is poorly understood, the outputs poorly measured, and the personnel highly professionalized, as with a major portion of the hospital, the rituals of the professions can be used.

Output controls require that the nature of the output be understood and measurable. Understanding the transformation process is not required. For instance, the factory manager knows how many tin cans are to be produced and exactly what standards/criteria each tin can should meet. Therefore, when machine operator A produces the expected number of tin cans that meet the standards, that worker's effectiveness is easily measured.

Behavioral controls are used where the organization, at the minimum, agrees about the means-ends relationship of the transformation process. The outputs are often not easily measured. Understanding the transformation process allows the process to be broken down into behaviors which can be observed. This allows the evaluation of the production process to be based upon observable behaviors rather than

the attempted measure of an output which is poorly, if at all, measurable. For example, it is impossible for a baseball coach to determine the contribution of each of his infielders to the team's output of double plays. The coach knows how each player should play his position in double play situations, therefore, he will use his assessment of the behaviors they exhibit as a measure of performance rather than their output of double plays.

In organizations where neither the transformation process is well understood nor the output easily measured, use of rituals is the usual form of control. This method usually relies upon a rigorous selection process for its employees. In a highly professionalized organization or subunit, the norms and values of the profession(s) are ready-made standards or rituals.

In health care, professional organizations, as well as state licensing boards, provide standards and guidelines for professional conduct. In addition, such organizations as the Joint Commission for the Accreditation of Health Care Organizations, provide standards and criteria for the organization which help guide professionals' behavior.

If, as has been proposed, highly professionalized organizations depend on professional standards as a means of organizational control, how do the professionals know how effective they are in their organizational practice? Although organizations have been characterized in many ways,

one way to view them is as information processing systems. "Information refers to data which are relevant, accurate, timely, and concise...information must effect a change in behavior ..." (Tushman and Nadler, 1978, p. 614).

In an organization such as a hospital where many professionals practice, data regarding individual patient conditions--laboratory values, radiology results, et cetera--are abundant, so that the professional can adjust a patient's therapy in a timely and appropriate manner. This flow of patient data is critical to the professional in judging his/her performance in treating the particular patient. The organization is structured to assure that the workflow is efficient in providing the patient-related data the physician needs in a timely manner.

From an organizational standpoint, information regarding overall provider performance is also critical. Although the quality of individual patient care is of great importance, the aggregated profiles of provider care are perhaps of more meaning to the organization as a whole. The organization attempts to discern patterns of care and deviations from expected standards. Recognizing that the effectiveness of the process of health care is contingent upon numerous influences, the hospital is interested in not only the case that deviates greatly from the norm, but also patterns of deviations--large or small. For instance, concern would arise if the number of normal appendix

specimens following surgery for appendicitis began to rise. This information is critical to the provider groups, not only for comparison to their professional norms, but also to their reference group, i.e., their peers within the hospital. This allows all involved to assess the performance of the organization and to make adjustments when needed.

Quality assurance programs in their many forms are charged with the task of monitoring the various aspects of care. They are organizational subunits charged with obtaining data and information which can be used in monitoring the performance of the delivery of care. The effectiveness of this structural subunit depends upon its collection of timely and appropriate data, the appropriate distribution of the information, and timely and appropriate actions by appropriate authorities to correct deviations. This entire process is based upon the flow of information through the organizational system.

Quality Assurance Information

The hospital is an organization facing a changing, tumultuous environment. The work done by the hospital--to provide health care--is uncertain, complex, and poorly analyzable. To decrease the uncertainty generated by the very nature of the work performed, a flow of accurate, relevant information regarding the effectiveness of the production process is needed. To meet this demand for

information regarding performance, a structure is established to gather, collate, analyze, and dispense the pertinent information. The task of obtaining and processing data should be rather routine, as long as the person(s) charged with this task has/have the authority, resources, and data access to do the job. A second function of the subunit is utilization of the data to evaluate and alter organizational effectiveness. This function of quality assurance mechanisms is fraught with difficulties due to the impingement of the organization on professionals' operational autonomy in an effort to control the professional.

It becomes obvious that quality assurance mechanisms have two distinct areas of responsibility which present diverse needs in regard to structural design. The data gathering and processing function, being rather predictable and analyzable, would seem amenable to a more bureaucratic structure. Being much more unpredictable and difficult to analyze, the utilization of the data would lend itself to a more organic structure. Although the structures may vary, the contingency perspective would indicate that some structures will be more appropriate for the various contingencies faced by the hospital, and thus facilitate the organization's effectiveness.

Summary

The theoretical framework for this research is based upon the open systems contingency perspective. Quality assurance mechanisms are conceived as the hospital's method of controlling professional performance in a rapidly changing, uncertain environment. The contingency perspective would suggest that the adequacy of the quality assurance subunit's design and resources, based upon the environment in which it exists, will impact on the hospital's performance.

Next, a review of several areas of literature is presented to support the generation of hypotheses relevant to quality assurance design and resources and adverse outcomes of hospitalization.

CHAPTER 3

REVIEW OF THE LITERATURE

Although quality of care research has been conducted for many years, the post-1983 health care environment has added new and urgent emphasis to this area of research. Consumers are demanding demonstrable good quality and third party payors are demanding good quality for a reasonable price. Society is looking for a way to bring skyrocketing health care costs under control or at least to slow the rate of increase while maintaining acceptable quality (Durenberger, 1986).

The federal government, as well as other third party payors, is concerned with the performance of hospital organizations in providing available, adequate, and safe care to the entire population but in a cost effective way (Griffith, 1986; Davis, 1986). Since the institution of the prospective payment system in 1983, concerns have increased regarding how hospitals will adjust to a slower rate of rise in reimbursements; therefore, pressures to monitor the quality of care delivered by hospitals have increased (Ginsburg and Hammons, 1988, p. 108). Not only is a

meaningful measure of quality needed but there is also the need to understand what influences the measured outcome (Davis, 1987, p. 1-2).

This research examines how quality assurance mechanisms and the organization's context impact upon adverse outcomes of hospitalization, the quality measure of this research (Figure 3, p.23). Quality assurance mechanisms were instituted with the goal of impacting favorably upon the delivery of care, yet little research has been done to evaluate how the design and function of this subunit impacts on quality.

A search of the literature regarding quality assurance structures, organizational design and the organizational impacts of size and specialization yields vastly different quantities and qualities of research. Studies considering the hospital's size, specialization, environment, structure, and control mechanisms will be examined to ascertain their influence on adverse outcomes of hospitalization. The review will focus on findings at the organizational/hospital level.

Quality Assurance and Quality of Care

As has been advanced in Chapter 1 (Figure 3), the adequacy of quality assurance design and resources affects both the way the subunit functions and adverse outcomes. Research studying the most effective structures for quality assurance mechanisms in health care organizations is scarce.

Although a significant amount of research has addressed the values of explicit and implicit criteria as measures of performance (Goran, 1979), only a few studies have addressed how the design of the quality assurance subunit actually impacts upon its goal of influencing quality of care in a positive way.

The 1976 study by the Institute of Medicine found that the major failing of the quality assurance mechanism was in not assuring that assessment findings were used to help improve the provider's behavior. Their findings focus then on the importance of applying the information gained in a manner such that change can occur (Institute of Medicine, 1976).

Luke and Boss (1981) identify ten barriers to institutional change and suggest more emphasis be placed on organizational and behavioral aspects of change, rather than technical considerations. Bliersbach (1988) supports this concern by urging more effort be placed on the application of data to achieving organizational change and less on technical considerations.

Sanazaro and Worth (1978) studied how concurrent quality assurance could be incorporated with an established concurrent utilization review program. The evaluation criteria for care were explicit or, as they called them, essential criteria monitoring three areas: diagnosis, documentation, and treatment. Hospitals from five PSROs

were randomly assigned to the experimental or control group. Subsequent withdrawals resulted in 24 experimental and 26 control hospitals from which 3,630 Medicare, 1,009 Medicaid and, 790 private patient abstracts were obtained. Physicians in the experimental hospitals were made aware of the assessment criteria prior to the collection period. The experimental hospital's quality assurance mechanism was designed so that the review coordinators determined any deviations from the criteria by the patient's attending physician and reported such deviations to the physician advisor. If the physician advisor determined that there was an unexplained deviation from the criteria, the advisor communicated with the attending physician who was not in compliance with the assessment criteria. It was up to attending physicians to decide if they wished to change their approach. There was no other role for the quality assurance mechanism other than notification. The control hospitals collected comparable data but did not inform attending physicians of deviations from the criteria.

The study results showed that where commitment to the research project was strongest, the extent and promptness of recording health histories and physical examination results was greatest. Of the 24 experimental hospitals, the two hospitals that did not post the criteria on the patient charts were significantly different (lower) in adherence to documentation criteria. Experimental hospitals were

significantly better than control hospitals in adherence to treatment criteria.

In attempting to relate quality assurance activity to outcomes, the researchers found that the patient's age was a more consistent predictor of outcome than either adequacy of documentation or adherence to treatment criteria. In the case of patients 55-84 years of age with bacterial pneumonia, there was evidence that adherence to indicated treatment criteria resulted in better outcomes. For patients 60-79 years of age, 48 hours post-myocardial infarction without hypovolemia, there was the finding that utilization of a contraindicated treatment was statistically significant for increased mortality.

In the experimental hospitals, review coordinators referred 600 of 2811 cases to physician advisors who communicated with the attending physicians on 120 cases. Only in the six hospitals where organizational commitment was the greatest did the contacted attending physicians change treatment.

This research study showed that strong organizational commitment and the formalization and standardization provided by posted criteria can impact quality of care. The study design ignores any means of enforcement when deviations were found omits an important component of what is currently considered part of quality assurance.

In 1978, Gertman and Egdahl published their study of

the 44 Massachusetts hospitals' utilization review programs. The study sample consists of all cases (both admission and extended stay reviews) questioned regarding appropriateness for continued hospitalization during a two week period (n=2,120/22,751). Data were collected regarding utilization review policies and procedures (i.e., decision-flow process), patient demographics, and hospital characteristics.

Using descriptive and multivariate statistics and simple tests of association, the results showed that "slightly more than 50% of hospitals allowed the utilization review (UR) coordinators to certify stays, to contact the patient's attending physician on their own initiative, and to discuss with the attending physician the appropriateness of a patient's continued hospitalization" (Gertman and Egdahl, 1978, p. 545). Another policy issue was the extent of physician advisor interaction with attending physicians when a case was questioned. Seventy-two and seven tenths percent (72.7%) of the physician advisors said they never tried to remain anonymous, 13.6% rarely, 6.8% occasionally, 4.5% almost always, and 2.4% always. It was also found that the UR coordinators' discretionary authority rose as physician advisor's desire for anonymity rose.

Of the 2,120 cases (10%) questioned, 170 patients had their benefits terminated or represented a voluntary early discharge. Almost two-thirds of all questioned cases and

94% of all terminated were Medicare patients. Increasing age and admission from a nursing home or chronic disease facility were also patient characteristics associated with being questioned. In hospitals where the UR coordinators had no restrictions on their dealing with attending physicians and the UR physician advisors chose to remain anonymous to the attending physician of a questioned case, the rate of terminations and early voluntary discharges per 100 beds was twice that of hospitals who put restrictions on their UR coordinators and the physician advisors chose to be known to the attending physician (p. 549). Hospital size, teaching status, and ownership were not statistically significant.

This study (Gertman and Egdahl, 1978) showed how the location of decision making authority can influence the effectiveness of the process. Although the study does not explore the extent or type of criteria used, it does indicate that the increased efficiency of the UR process as demonstrated by the placement of decision-making authority at the staff (UR coordinator) level impacts quality of care.

Expanding on Gertman and Egdahl's work, Restuccia (1982) studied the effect of several utilization review (UR) designs in reducing inappropriate hospital utilization, as measured by inappropriate hospital days and case-mix adjusted length of stay (LOS). Employing four feedback design strategies: (1) Direct Feedback (DF) - the

coordinator interacts directly with the attending physician; (2) Indirect Feedback (IF) - the coordinator interacts with a physician advisor who then decides whether the advisor will contact the attending physician; (3) No Feedback (NF) - neither the attending physician nor the physician advisor are advised of inappropriate patient hospitalizations; (4) Judgemental Feedback (JF) - the coordinator has the discretion of contacting the attending physician or physician advisor or neither. Restuccia studied their effects in four acute care general hospitals in the San Francisco area. All of the UR coordinators were registered nurses and experienced in their jobs. The study included only Medicare patients and used the Medicare level-of-care criteria for judging the appropriateness of stay. Physicians in the study hospitals, except the chairman of the utilization review committees and directors of medical education, were not informed about the study. Data were collected over a two month period at each hospital.

Analysis of the data indicate that there were statistically significant differences among the four strategies. There was approximately one-half day less of inappropriate utilization for the group who interacted directly with the attending physicians (DF) and the one that had the latitude of deciding whether to contact the attending physician directly and/or the physician advisor (JF) as compared to the group which received no feedback

(NF). When LOS was used as the dependent variable, the results were similar except the direct strategy was less influential. When patients experiencing environmental barriers to discharge were eliminated from the sample, the same pattern of findings emerged but with greater differences. Using inappropriate days as the dependent variable, the study found 1.5 days and 1 day differences respectively between the judgemental and direct strategies and the no feedback and indirect (UR coordinator reports to physician advisor who talks with attending physician) groups respectively. No difference was found between the control group and indirect strategy. There was over 3.5 days difference in LOS between the judgement strategy and control groups. No other differences in LOS were significant.

The Restuccia (1982) study's findings were:

1. Direct feedback is more effective than indirect or no feedback.
2. The more discretion permitted the UR coordinator, the more likely is the utilization review system effectiveness.
3. The greater the proportion of environmental barriers causing inappropriate utilization, the less control the utilization review system is capable of exerting and, thus, the more likely is inappropriate utilization (p. 58).

The author also noted that in two hospitals that did

not provide adequate resources (i.e., enough UR coordinators to process the workload) for the utilization review program, the UR coordinators were not able to use their discretion as often or in as timely a manner as they wished.

The study supported the major hypotheses that the more direct the feedback, the greater is the control over professional performance; greater discretion allowed in the feedback decision results in greater control over professional performance; and an effective system is achieved by direct feedback to attending physicians without the sanction implied by using a physician advisor (pp. 60-61).

This study supports the findings of Gertman and Egdahl that decision-making authority placed at the staff level is most effective. It also illustrates the importance of organizational commitment to the effectiveness of utilization review.

Rosen and Feigin (1982) studied peer review activities in eleven acute general care hospitals in the greater New York metropolitan area. Although entirely descriptive, the study found that only 2 of the 11 hospitals had a system which guaranteed that review information gathered by one committee charged with an aspect of quality assurance would/could be used by another quality assurance committee. Anecdotal evidence is used to illustrate how failure to convey information to all concerned committees resulted in

adverse impacts on quality of care. They also noted that the failure to have physicians serve on more than one of the quality assurance committees resulted in the absence of informal information linkage.

This study illustrates the need for a formalized structure for quality assurance activities with hierarchial relationships clearly established and monitored. It also demonstrates the need for establishing coordination mechanisms to ensure quality assurance.

Organizational Design and Quality of Care

Although there is a paucity of empirical research on the structure and function of quality assurance mechanisms, there is related research in health care on organizational design and effectiveness.

Neuhauser (1971) applied the Entrepreneurial theory of formal organizations to 30 medium sized, short term, general, not-for-profit, community hospitals in the greater Chicago area. He identifies two components of the hospital--the medical component and the non-medical component. The medical component is the physicians, while the non-medical component is everyone else regardless of level of professionalization. The quality of care outcome measures used for the medical component are subjective expert evaluation, the JCAHO evaluation, training of the medical staff, and a severity-adjusted death rate (SADR). The independent variables of interest to this study were:

visibility of consequences (managerial awareness) - (the extent the administrator and Chairman of the Board of Trustees were able to rate their hospital, on a five-point scale, in relation to peer hospitals in the Chicago area on four aspects of medical staff performance) and specification of procedures (the extent that the hospital had a drug formulary; used required tests on newly admitted patients; required consultations prior to the performance of certain surgical procedures; placed restraints on the range of hospital activities each physician could perform; used sanctions against physicians; and was perceived to be influenced by physicians).

The results indicate that the existence of reports and visibility of consequences are positively related to the quality of care. His hypothesis that higher specification of procedures in a complex task environment will adversely affect quality of care is poorly supported by only 3 of 18 relationships being statistically significant, and only 11 of 18 being in the expected direction. Further analyses showed that only 3 of 9 measures of specification of procedures were significant when applied to the use of control measures applied by the organization, rather than physicians, even though 8 of the 9 relationships were in the expected direction. The findings further show that these hierarchically imposed control measures are positively and significantly related to the adjusted death rate and

negatively and significantly related to the JCAHO evaluation. The third measure of quality is not related at a significant level which suggests that greater specification adversely affects quality of care.

Further confirmed hypotheses are:

- that the higher the visibility of consequences, the more likely the extent of specification of procedures will be optimal.
- the effects of the extent of specification, volume of reports, and visibility of consequences on quality of care are additive.

These analyses suggest that physician participation in decision making is related to higher quality of care. Thus, increased physician participation and an increased autopsy rate (visibility of consequences) offers the possibility of a large potential lowering of the standardized adjusted death rate.

Shortell, Becker, and Neuhauser (1976) studied the effects of management practices on hospital performance in 42 short-term, voluntary, non-teaching Massachusetts hospitals with 100 or more beds. Data regarding hospital costs, quality of care, and operating statistics were collected for a 12 month period from October 1971 through September 1972.

The outcome measure of interest to the current study was their use of medical-surgical death rate, and post-

operative complication rate following clean surgery, as the measures of quality of care. The independent variables studied included visibility of consequences (percent of operating procedures the administrator could not make an estimate, percent of operating procedures the administrator could not compare his hospital to peer facilities in the area, the percent of operating statistics the president of the medical staff could not estimate, the percent of operating statistics the medical staff president could not compare his hospital with area peer facilities), specification of work procedures (extent nonmedical support department heads were free to determine what, when and how they did their work; extent to which medical support department heads were free to determine what, when and how they did their work; extent to which a sample of medical support personnel were free to decide what, when and how they did their work; extent to which key medical staff members believed that the medical staff as a group was free to determine what, where and how the clinical work was to be done; and extent to which key medical staff members believed that individual physicians were free to decide what, when, where and how their clinical work was to be done), coordination mechanisms (the ratio of: impersonal to personal and group methods of coordinating work for nonmedical support department heads and key medical staff members; informal consultations to formally scheduled

meetings involving the laboratory director or assistant with members from nursing service and radiology; informal consultations to formally scheduled meetings involving an assistant director of nursing service with members of the laboratory and radiology departments; informal consultation to formally scheduled meetings involving the chief radiology technician; and the number of regularly scheduled meetings involving the chief radiology technician with members of the nursing service and laboratory departments), absence/presence of a pre-admission testing program, average length of stay, and participation in decision-making.

The findings indicate that increased reliance on scheduled meetings between the highly professionalized departments--nursing and the clinical laboratory--results in a lower post-surgical complication rate. The measures of coordination among radiology, nursing, and the clinical laboratory helped explain 19 percent of the variance in post-surgical complication rates. As with complication rates, the results suggest that greater reliance on formally scheduled meetings of nursing with radiology and the clinical laboratory is associated with a lower medical-surgical death rate. Conversely, the data suggest that the death rate is lower if radiology relies on less regularly scheduled meetings with nursing and the clinical laboratory.

For the medical staff, greater perceived autonomy is associated with higher medical-surgical death rate. Yet, a

lower medical-surgical death rate is associated with greater participation of department heads in operating decisions. When medical-surgical death rate is the dependent variable, management variables explained 60% of the variance.

This study highlights the effect various management variables that affect relationships among professionals can have on quality of care. To the investigators' surprise, they found that greater structure in staff functioning was associated with better performance.

Becker, Shortell, and Neuhauser (1980) looked further at the role management practices can play in hospital performance, specifically length of stay. Using the same sample described in their 1976 study, they used overall average length of stay, overall average Medicare length of stay, and post-operative Medicare length of stay as dependent variables. Independent variables include measures of visibility of consequences (percentage of eleven operating statistics for which the administrator could not compare his hospital with similar area hospitals), specification of work procedures (the extent to which nonmedical support department heads perceive they are free to determine what, when and how they do their work; the extent to which medical support department heads perceive they are free to determine what, when and how they do their work; the extent to which medical staff leaders perceive

that the medical staff as a group has autonomy in clinical activities; the extent to which medical staff leaders perceive that the individual physician has autonomy in clinical matters; and a comparative measure of medical support department heads autonomy relative to nonmedical support department heads autonomy), and control mechanisms.

The results indicate that the lower the work specification (more perceived autonomy) for the medical staff in relation to clinical matters, the shorter the Medicare preoperative length of stay. Longer preoperative length of stay was also associated with a higher medical-surgical death rate. For overall Medicare length of stay, work specification and coordination mechanisms are both statistically significant. The more autonomy the individual physician is perceived to have, the longer the length of stay for Medicare patients. Also of significance is the relationship between longer length of stay and the physician's reliance on personal or group methods of coordination with medical support department heads. For nursing, radiology, and the clinical laboratory, a greater proportion of informal to formal meetings was associated with a shorter length of stay. For medical support department heads, reliance upon personal or group coordination mechanisms in relation to their nonmedical support counterparts results in a shorter Medicare average length of stay. For the average length of stay for all

patients, the lower the visibility of consequences, the longer the length of stay, and the less work specification for medical support heads to that of nonmedical support heads, the longer the length of stay.

This research (Becker, Shortell and Neuhauser, 1980) highlights the differential effect of organizational design factors on various components of the hospital and the impact on length of stay.

Shortell and LoGerfo (1981) examined the relationships among hospital structural variables, individual physician characteristics, medical staff organization characteristics and quality of care for acute myocardial infarction (AMI) and appendicitis patients. Approximately 50,000 AMI cases and 8,183 appendectomy cases from 95 hospitals were examined. The outcome measure of quality of care for AMI patients was a standardized mortality ratio and for appendectomy patients, a standardized normal tissue removed (SNTR) ratio. The independent variables were indexes of "resource capability" (a measure of the hospital's ability to attract qualified staff), "participation in decision making" (a measure of physician involvement in hospital wide decision making bodies), and "local staff orientation" (a measure reflecting smaller hospitals with fewer physicians and thus fewer physician committee members).

The results showed, among other findings, that having the president of the medical staff on the board of directors

was strongly associated with lower AMI standardized mortality ratios. Physician participation in hospital decision making had a moderately strong affect on lowering AMI standardized mortality ratios. Although not statistically significant, the local staff orientation factor was associated with a higher AMI standardized mortality ratio.

For appendectomy patients, the frequency of medical staff committee meetings, the degree to which physicians concentrate their activities at the study hospital, the percent of physicians on contract and the presence of a director of medical education were each associated with a lower standardized percent of normal tissue removed.

These findings, as have previous ones, highlight the differential effect organizational design and, thus, control can have on health care outcomes.

Flood, Scott, Ewy, and Forrest (1982) studied the impact of surgeons and surgical staff organizations on the quality of care in 15 hospitals. Focusing on 15 surgical procedures associated with large numbers of deaths and complications, they used morbidity at 7 days post-surgery and/or mortality at 40 days post-surgery. Patient data pre-operatively and at 7- and 40-days post-surgery were obtained. Individual surgeon and corporate organizational data were obtained.

Although the analyses were done at the patient level,

they are of interest. The findings show that two measures of surgical staff organization were significantly associated with quality of care--the proportion of contract physicians and the number of surgical specialties. The higher the level of each, the better the quality of care. The analyses suggest that both the hospital context and the professional staff structure account for differences in organizational effectiveness to a much greater degree than do individual surgeon characteristics.

Theory would suggest that professional norms would be adequate to control professional practice, but the research performed with professional organizations, such as hospitals, demonstrates that formal quality assurance programs can positively affect the quality of outcomes. As has been advanced earlier in this chapter, the impact of quality assurance programs may be the role they play in collecting and collating data and making it available to those individuals and/or groups that can effect a change in the care process.

Adequacy of Quality Assurance Design and Resources and Adverse Outcomes

As discussed in Chapter 1 (Figure 3), the adequacy of the quality assurance subunit design and resources affects the incidence of adverse outcomes.

Organizational Design and Performance. As the preceding research has addressed many of the issues

regarding the impact of organizational design and control on performance in health care, so too has research in other organizations shown how organizational design and function impacts on performance.

Research by Child (1973), Ouchi (1977), Glisson (1978), and Peterson (1984) have demonstrated the importance of standardization, formalization, centralization, specialization, and hierarchy of authority in relation to organizational performance and in relation to contextual characteristics. Much of the research found in relation to quality assurance in both health care and other highly professionalized organizations relates to the question of organizational design and control but is anecdotal.

Katz (1986) describes a cybernetic type quality assurance mechanism which is patient- and prevention-oriented and is characterized by flexibility, yet, retains adequate control. A major point of Katz's discussion is the emphasis on the necessity of commitment to the program by management and the medical leadership.

The Joint Commission on Accreditation of Hospitals (1986) sets out nine steps in a monitoring and evaluation program which include adequate delineation of responsibility and the scope of service, identification of indicators, establishment of criteria, data collection and analyses, generation and implementation of plans for problem resolution, assessment of actions taken, and communication

of information. They also emphasize the importance of organizational commitment to the effectiveness of quality assurance.

Berwick and Knapp (1987) describe the quality assurance program for the Harvard Community Health Plan (HCHP). The program, called the Quality of Care Measurement (QCM) Program, is conceived as a data gathering mechanism which makes available to the assurers of quality care (i.e., those persons who provide and support the provision of care) the objective information they need to manage their practice. The program gathers data from a number of sources utilizing numerous techniques due to the multidimensional definition of quality employed. Emphasis is placed upon timeliness of the data made available to the assurers. Criteria and measures of clinical performance are generated by the providers, and methods of data collection are designed by the QCM staff. Where possible, the computer system is used to facilitate quality of care monitoring by providing follow-up of specified categories of patients and providing reminders to the patient's provider of the need for follow-up care. Adherence to established criteria is also monitored by the computer.

From the anecdotal evidence, it appears that the quality assurance mechanism at the HCHP serves as a support service to the providers by gathering and collating data. Organizational support appears substantial in that the QCM

program is an independent subunit which reports directly to the highest policy making level. It also appears that there are significant resources available to the program for meeting its goals.

Lee and Ebrahimpour (1985) compare quality control systems in Japanese and American manufacturing firms in an effort to discern why there are such differences in performance. Japanese firms view the customer as the primary source of quality evaluation and demand, as opposed to American firms which do not give customers' desires such primacy. American firms do not place as much emphasis as do the Japanese firms on improvement of quality through alterations in the process design as a result of workers' feedback. Japanese firms utilize extensive statistical quality control methods which are understood by, made available to, and used by all workers. Training, an ongoing process in Japanese firms, is viewed as an integral part of everyone's job, rather than, as in American firms, a costly luxury in many instances or a costly necessity in others. Quality control, which permeates the entire production process in Japanese firms, is seen as a preventive process, rather than, as in American firms, as being a correction of production errors which takes place at the end of the process.

The authors emphasize that the Japanese approach to quality assurance rests on organizational commitment--from

CEO to the lowest worker. Deming is quoted as saying that "Management support is one of the more important elements in Japanese achievement in quality control" (p. 29).

This article highlights the need for organizational commitment, adequate resources, and a process design which makes the information needed to assess quality available to those who are producing the product. It is also pointed out that responsibility for quality rests with all workers.

Kane (1986) describes how IBM incorporates a quality focus in its business process. The business process is defined as "the closely related decisions and activities required to manage and administer the resources of business" (p. 25). This involves "complex, cross-functional processes typified by few measurements and unknown limits" (p. 25).

The design IBM employed is characterized by the assignment of responsibility (ownership) to the appropriate individual so that he or she can monitor the process and document needs. The individual assigned ownership also has to be placed high enough in the organization to influence change and assess and monitor its business-wide impact. The plan requires the definition and documentation of the process and the identification and measurement of problems. Kane, as have others who study quality assurance, emphasizes the need for organizational commitment to quality. The design advocated employs quality monitoring throughout the process with constant feedback to those most responsible.

The effectiveness of the quality process is supported by declines in the number of late, incomplete, and defective orders.

Nollet and Queirllon (1988) report on the incorporation of a quality assurance department in an accounting firm. As others who have studied quality assurance, the authors emphasize that a philosophy of ensuring quality work is imperative from the partners down to the lowliest employee. In a highly professionalized firm such as that provided by accounting firms, an emphasis is placed upon recruiting the most highly qualified personnel and then providing continuing education programs to obtain and maintain a quality product. Due to the complex nature of the auditing process, peer review is used as the quality control mechanism. Use of planning memos, schedules, audit programs, and internal control questionnaires control and evaluate the audit process.

The approach to quality control in the accounting firm is similar to that in other highly professionalized areas. The professional standards of the employee along with written guidelines, are major control mechanisms for the auditing process. Organizational commitment along with the employee's professional commitment are considered essential to the success of quality assurance mechanisms.

Quality assurance is a relatively recent concern in the health care arena. Although much has been drawn from the

industrial sector's experience in quality assurance, its application to the unique organizational and process features of hospital based health care is fraught with concerns. The poor ability to understand the health care production process, the high degree of variability, and the difficulty in measuring outcomes all make control of the process difficult. In addition to these concerns, the characteristics of highly professionalized provider groups supported by a group of support personnel with varying levels of skills makes the quality assurance task much more difficult.

Even when the formal structure provided by the organization to support quality assurance activities seems adequate, there is evidence that other factors are necessary. Among the authors cited previously, organizational commitment was singled out repeatedly as essential to success (Katz, 1986; Berwick and Knapp, 1987; Lee and Ebrahimpour, 1985; Kane, 1986; Nollet and Queirllon, 1988). Along with commitment of the organization, as demonstrated by adequate fiscal and personnel allocations, is perceived commitment to the program. This would address the perceptions of those charged with quality assurance of the support they receive from not only management, but also from clinicians and support personnel. Such authors as Deming (1982), Berwick and Knapp (1987), Kane (1986) and others emphasize the importance of commitment to the process

from the CEO to the lowest employee.

Hetherington (1982) maintains that the establishment of a quality assurance mechanism is, in essence, formalization of medical care activities (p. 190). With this formalization comes increased tensions among providers, quality assurance personnel including physician advisors, and management because of the organization's incursion into professional freedom. As medicine is demystified to some extent, power shifts away from physicians and toward management. Therefore, the organization must balance its needs to insure quality of care through increased formalization with the professionals' demand for autonomy. This effort is partially made through the structural design of the quality assurance subunit and that unit's functional adequacy.

Organizational Size and Specialization. Organizational size has been of interest to researchers for many years (Pugh, Hickson and Hinings, 1969; Child, 1972; Van de Ven, 1976; Dewar and Hage, 1978). The influence of size has been assessed in relation to specialization, technology, decision-making, strategic choice, and a host of other factors. This review will focus on size and specialization and their relationships to structural and functional design issues and outcome measures (Figure 3).

Pfeffer (1982) summarizes the early research in this area by citing work done by many of the earliest

investigators. Pugh, Hickson, and Hinings (1969) found that size was the most powerful predictor of a measure of specialization, use of procedures, and reliance on paperwork. Blau (1970) found that size generates structural differentiation within organizations. "The basic arguments from the size literature are that size leads to increasing structural differentiation, that size is negatively related to centralization, that size is positively related to formalization, and that size is related to the size of the administrative component ..." (p. 149). Research by Blau and Schoenherr (1971) in state employment agencies and by Meyer (1972) in state and municipal finance departments support these hypotheses.

Child (1972) argues that increasing size offers opportunities to use the benefits of increased specialization. Increased specialization influences greater structural differentiation which places greater pressure on managers to increase their control by increasing formalization and decentralization of decision making (p. 7).

Van de Ven (1976) draws upon organizational research to propose a framework for organizational assessment. Among the research areas he draws from is that on organizational size. Citing Child's (1973) empirical examination of size and organizational differentiation, he summarizes by saying that increases in size are related to increased horizontal

and vertical differentiation yet at a decreasing rate. In addition, the structure of organization subunits is "hypothesized to directly reflect the qualitative difficulty and variability of the tasks it is assigned, and indirectly by the overall structural differentiation of the organization." (p. 69).

Dewar and Hage (1978) report on a longitudinal study by Aiken and Hage of sixteen social service organizations in 1964, 1967, and 1970. The findings indicate that organizations with diversified and specialized occupational structures become more so and increase organizational complexity or specialization. In essence, the volume of activities in an organization (a measure of size) allow a certain level of specialization. Also of interest was the finding that additional levels of organizational differentiation occur in large organizations as a result of increasing task scope rather than due to an increase in size. For smaller organizations, size is the major predictor of vertical differentiation (p. 125). The authors suggest that as a new activity becomes more important to the organization, it may be removed from the hierarchy of levels and added as a new department (p. 126). In the area of horizontal differentiation, organizational size is the predominant influence.

Daft (1989) summarizes the findings of organizational research related to size and specialization:

"Greater organization size is associated with the following:

1) increased number of management levels (vertical complexity)
2) greater number of jobs and departments (horizontal complexity)
3) increased specialization of skills and functions
4) greater formalization
5) greater decentralization
6) smaller percentage of top administrators
7) greater percentage of technical and professional support staff
8) greater percentage of clerical and maintenance support staff
9) greater amount of written communications and documentation." (Daft, 1989, p. 185)

He emphasizes that size does not cause the other structural variables but they tend to influence each other and be influenced by size.

In summary, greater adequacy of quality assurance mechanism design and resources are expected to result in decreased incidences of adverse outcomes. This is anticipated to occur because of the improved ability of professionals to monitor the care they deliver, as a result of improved information processing. As the quality assurance subunit's context --the hospital--varies, so should the subunit's design. The contingency perspective would then predict that when the elements of the context and subunit are properly fitted the organization's performance would become more effective.

Adverse Outcomes of Hospitalization

The dependent variable for this research is a

measurement of adverse outcomes patients can suffer as a result of being hospitalized. This multiple indicator measure of one aspect of quality of care is unique to the current state of quality of care research. The majority of research in this area has utilized a single outcome measure, such as adjusted mortality rate or nosocomial infection rate, rather than a composite measure.

Studies using the organization as the level of analysis are not as numerous as those which have used the patient as the unit of analysis. Although it is hazardous to extrapolate findings from one level of analysis to another due to the effects of aggregation and disaggregation on the findings, these patient-level findings may indicate the need to explore that variable at the hospital level. For this reason, some of the proposed variables for this research have been found significant in predicting outcomes, not at the hospital level, but at the patient level.

Flood, et al. (1979) examined the records of 603,000 patients treated at 17 U.S. acute care hospitals between 1970-1973. All of the hospitals were participants in the Professional Activities Study (PAS) of the Commission on Professional and Hospital Activities (CPHA) in 1973. Sixteen of the hospitals were selected as a stratified random sample of all short-term, non-federal voluntary hospitals participating in PAS, with the seventeenth hospital which was administratively linked to one of the

sample hospitals volunteering to participate. The sample was stratified by hospital size, teaching status, and per patient day expenditures.

The research examined the relationship between intensity and duration of medical services and outcomes for hospitalized patients. The measure of patient outcome was death in hospital. Adjustments in measures of service intensity and outcome were made for patients' disease and physical condition. Due to substantial underreporting, in-hospital complications was dropped as an additional outcome measure.

Length of stay (LOS) was used as a measure of service duration while a composite index, including the total amount of medical services received, the amount of each specific service received and the relative costliness of each type of service received, was used to measure service intensity. These indices were each standardized for the patient's admission status, their surgical or medical treatment, complications, and their discharge status.

The data show that a greater number of specific services is associated with a lower death rate. While the initial analysis showed that a longer LOS is associated with an increased death rate, further investigation showed that the impact of the duration of services on outcome were mediated by geographical variations.

The finding that geographical region mediates the

effect of length of stay on outcome can be addressed in the current research because it is confined to a single state. Although there may be variations within small areas, there is less likelihood that they would be as great as from one region of the country to another. For this reason, length of stay is a reasonable variable to include in this research.

Utilizing 1974-1975 data supplied by the Commission on Professional and Hospital Activities (CPHA), Ann Arbor, Michigan, Luft (1980) studied the relationships among various demographic, financial, and organizational variables and surgical volume and mortality. Corrections for case severity, using age-, sex-, and single-or-multiple-diagnosis--specific death rates for the whole sample, weighted by the proportion of each hospital's patients who were classified in each of the 20 age-, sex-, and diagnosis cells, were calculated. Variables from the National Center for Health Statistics Master Facility Index (1975) which were merged with the CPHA data included: total beds per hospital, total number of admissions, total number of operations, ratio of house staff to beds (residents plus interns/per bed), a dummy variable indicating a hospital's location in a SMSA; dummy variables for major geographic regions where the hospital was located, and the average total expenses per patient day.

Utilizing multiple regression, Luft found that there

was a significant inverse relationship between the log of patient volume and mortality, which remains essentially the same regardless of the inclusion or exclusion of other variables. It was also evident that the strength of the relationship varied by surgical procedure, especially for procedures with normally low mortality rates. Statistically significant relationships between the two measures of hospital size showed little consistency to excess mortality while controlling for volume of the specific operative procedure. Admissions had a positive relationship for vascular surgery and open heart surgery. Luft also found substantial geographic differences in mortality rates. Surprising results which were not easily explained included worse outcomes the larger the house staff per bed ratio and worse outcomes in larger hospitals for vascular and open heart procedures, controlling for procedure-specific volumes. The author interprets the findings relative to size as meaning that larger hospitals do not have better results, rather than that larger hospitals have worse results, controlling for the volume of the procedure in question (p. 950).

The implications of Luft's study support the potential importance of referrals on the quality of care delivered by the hospital. In addition, the mixed effects of the various measures of size on outcomes measures support the need to further study the relationship.

In 1980, Gross, et al. studied deaths from nosocomial infections in two hospitals--one community and one university. No statistically significant differences were found between the hospitals. Statistically significant differences were found between patients who were in intensive care units, those who had invasive procedures and monitoring, were in their late seventies, and had comorbid conditions of arteriosclerotic cardiovascular disease and/or cancer and those patients who did not get a nosocomial infection. Patients with a nosocomial infection had a mean length of stay of more than one month as compared to ten days for those without a nosocomial infection.

This study demonstrates the effect nosocomial infections has on patients and their importance as an adverse outcome.

Farber, Kaiser, and Wenzel (1985) studied the relation between surgical volume and the incidence of postoperative wound infections at twenty-two community hospitals in Virginia and nearby states. They found that the volume of the surgical procedure was a significant predictor for certain procedures, yet was of equivocal or no use for other procedures.

Postoperative wound infections are, by definition, an adverse outcome. They account for twenty percent of all nosocomial infections, and occur at a rate of eighty-one per 10,000 patients hospitalized (Farber, et al, 1985, p. 200).

These studies highlight the impact of nosocomial infections on the outcome of care, but also reflect upon the quality of the process of care. The concern raised is how the process of care, either surgical procedures or invasive monitoring procedures, contributes to the incidence of nosocomial infections.

Hebel, et al. (1982) studied over 86,000 hospital discharges from four hospitals in an attempt to develop a method of case mix adjusted death rates. Comorbidity was shown to be the third largest contributor to the bias potential (e.g., explained variation in death rates). The authors comment on, although do not statistically test, the effect of referrals on mortality rates by the concentration of more gravely ill patients in certain facilities.

These findings support other research which shows poorer outcomes are more likely with patients with comorbid conditions and in referral centers.

Roos (1984) conducted a correlational analysis of surgical rates and mortality in which he found that males had a significantly greater danger of surgery-associated mortality than women. He hypothesized that stress may play a role in the gender related differences.

In the Hobler, et al. (1984) study of biliary tract surgery and the relationship between cost and quality of care (measured by mortality and complication rate), it was found that age 70 or greater, comorbidity, and/or

postoperative complications were all associated with longer lengths of stay and higher mortality rates than for uncomplicated surgeries.

As has been seen in previous research, advanced age, comorbidity, and postoperative complications are associated with poorer outcomes of care such as high mortality.

Between 1974 and 1977, Anderson and Steinberg (1984) studied the hospital readmission rates of 270,266 Medicare beneficiaries. This is a 1% random sample of all Medicare beneficiaries from 1974-1977. During that period of time, 22.5% of Medicare hospitalizations were followed by a readmission within 60 days of discharge. These patients accounted for 80% of Medicare's inpatient hospital expenditures during that time. Readmission was shown to be higher among Medicare beneficiaries less than 65 years old, who were male, lived in a rural area, and who were eligible for Medicaid. Surgical patients had a lower probability of readmission. Regional variability was not statistically significant. Readmission rates were significantly higher in teaching hospitals, as opposed to nonteaching hospitals, and in hospitals with less than 100 beds. Readmission to hospital is an undesired outcome. Anderson and Steinberg's research highlights that chronic disease and sociodemographic factors can influence the rate of rehospitalization, as do several organizational characteristics.

Roos, et al. (1985) also address readmission to hospital as well as postoperative complications. They found that readmission within 90 days of discharge picked up the overwhelming majority of postoperative complications. Roos, et al. (1986) studying readmission for complications after surgery, found that although the variables which helped predict readmission were specific to each procedure studied, comorbidity was significant for all procedures studied. The only organizational variable of significance was the hospital's volume for each surgical procedure.

Supporting the preceding research, Hughes, Hunt, and Luft (1987) found that both hospital volume and the proportion of patients operated on by "low volume" surgeons are related to quality of care, with hospital volume being more significant. Other variables of significance include a greater number of patients transferred in, and a longer average length of stay which are associated with worse outcomes; while patients being grouped in special units (e.g., a urology unit) are associated with better outcomes. The outcome measure used for this research was an additive score composed of the values of actual deaths divided by expected deaths, and actual long stay patients divided by expected long stay patients (i.e., patients with very long length of stays).

In a study by Dubois, Rogers, Moxley, Draper, and Brook (1987) using adjusted hospital death rates as screens for

quality of care, it was found that the percent of patients over age 70, the percent of patients admitted from the emergency department, the percent of patients admitted from a nursing home, and the hospital case mix index were all strongly correlated with the crude death rate. Multiple regression analysis showed that those four variables accounted for two-thirds of the disparity among the 93 study hospitals. The study sample, although large (205,000 discharges), is taken from proprietary, non-teaching, non-governmental hospitals located in the western, central and southeastern United States. In addition, no adjustment for severity of illness was made.

To test the accuracy of the model reported in the preceding study, Dubois, Brook and Rogers (1987) used clinical data from medical records to compare the model's predictions with clinical experts' subjective and objective assessments of the quality of care. After adjusting for severity of illness, subjective review found greater levels of unexplained preventable death except for myocardial infarction, in high outlier hospitals. Explicit or objective review of the process of care found no differences between low and high outlier hospitals. The authors hypothesize why this discrepancy is found, yet have no concrete answer.

Goldfarb and Coffey (1987) studied teaching and non-teaching hospitals to ascertain differences in case-mix.

Using both DRGs and disease staging, the investigators tried to isolate case mix attributed to a patient population versus that attributed to hospital treatment standards. Dividing teaching hospitals into three levels of involvement in teaching, the researchers tried to discern the effects of various levels of involvement in teaching on outcomes. The research found no differences in case mix between teaching and non-teaching hospitals when a non-resource dependent measure (disease staging) was used. When DRGs, the resource dependent measure, were used, teaching hospitals with the greatest commitment to teaching were found to have a significantly more costly case mix. Other findings are that teaching hospitals employ more resources in treating patients; presence of a teaching program results in an increased length of stay, holding case mix constant; presence of a teaching program increases the probability of surgery and the resource intensity of the surgery, and medical school based hospitals admit a greater proportion of patients with diagnoses that are likely to be fatal. There were also no differences between the four categories of hospitals (three teaching, one non-teaching) in mortality rates.

Wan and Shukla (1987) studied the quality of nursing care in 45 community hospitals in the United States. As their outcome measure, they used incident rates for medication errors, errors in intravenous line

administration, patient falls, patient injuries, and inappropriate diagnostic and therapeutic interventions. Also included were a number of contextual and organizational variables.

Strong correlations were found between the outcome measures medication errors, IV administration errors, and diagnostic/ therapeutic errors, as well as between patient falls and injuries. The only other variables related to the outcome measures were the community hospital bed supply, and the age, and education of the population.

This study demonstrates the importance of in-hospital traumas on the quality of care.

A book by Flood and Scott (1987) compiled the findings of a decade or more of research on hospital structure and performance conducted by the Stanford Center for Health Care Research. Using summary data from 1,224 short-term hospitals in the United States that participated in the 1972 Professional Activity Study (PAS) of the Commission on Professional and Hospital Activities (extensive study-ES) and indepth data from seventeen of the ES hospitals (intensive study-IS), the researchers studied quality of hospital care, measured using structural, process and outcome measures, and how service intensity, organizational and individual provider characteristics, and technology impact it.

The research found that quality of care varied up to

twofold among hospitals. There was also strong evidence that there is great intrahospital variation in quality of care. Hospitals providing greater than average specific services to patients had better outcomes than those hospitals supplying fewer services. In addition, a shorter adjusted length of stay inhospital was associated with better quality of care. This difference did not persist when regional location was taken into account.

The research also found that there is weak and inconsistent intercorrelations among structural, process, and outcome indicators. This suggests that they are measuring different dimensions and should not be considered interchangeable indicators of quality. Structural indicators used were the elaborateness of facilities, the proportion of board-certified surgeons, and JCAHO accreditation. Process indicators used were proportion of surgical patients with normal tissue removal as evidenced by pathology reports, proportion of autopsied inhospital deaths, and the proportion of patients utilizing intensive care facilities. Outcome measures utilized were standardized inhospital mortality, and the rate of post-operative complications.

Hospital-wide characteristics were found to have a greater impact on surgical outcomes than did characteristics of individual surgeons. This was found to be related to the surgical staff's ability to regulate the behavior of its

members, as seen by the strictness of admission requirements for new staff and the length of the probationary period. Hospitals which had stronger medical staff structures, more experience in treating similar patients, medical school affiliation, a lower house staff-patient ratio, or higher reported expenditures per patient episode were more likely to provide better care.

Technology, as measured by the complexity and uncertainty of tasks, was most meaningful at the subunit level. Distinction between individual task demands and workflow demands at the subunit level were found to be important. Higher professionalization and level of worker training were found when tasks were less predictable. Unpredictable workflow was associated with reduced standardization and centralization of decision-making.

At the hospital level, it was found that patients cared for in more elaborate facilities were more likely to receive more services than expected which cost more than the average.

This effort to bring together the extensive research done by the Stanford Center on hospital structure and performance demonstrates the complexity of the relationships among the hospital structure, the process of providing care, and the outcome of that process.

Shortell and Hughes (1988) studied the effects of governmental regulation, competition, and hospital ownership

on mortality rates among hospitalized patients utilizing more than 214,000 Medicare patient records in 45 states. They found that higher mortality rates were seen among inpatients and more stringent review procedures, more stringent certificate of need procedures, greater market penetration by HMOs, increased percent of patients 75 years or older, increased percent of patients with comorbid conditions, increased length of stay, and an increased percent of patient days in intensive care units.

This review of research dealing with quality of care highlights the validity of using the following variables in a model of adverse outcomes of hospitalization:

- nosocomial infections (Farber, Kaiser, and Wenzel, 1985; Gross, et al., 1980).
- postoperative complications (Roos, et al, 1985; Hughes, et al., 1987; Flood, et al., 1979; Hobler, et al., 1984).
- in-hospital trauma (Wan and Shukla, 1987).
- referrals (Luft, 1980; Hughes, Hunt, and Luft, 1987; Hebel, et al., 1982).
- transfers in from the emergency room or a nursing home (Dubois, Rogers, Moxley, Draper, and Brook, 1987).
- percent males (Roos, 1984).
- percent surgery (Anderson and Steinberg, 1984).

- percent greater than 70 years old (Hobler, et al., 1984; Dubois, Rogers, Moxley, Draper, and Brook, 1987).
- comorbidity (Hebel, 1982; Hobler, et al., 1984; Roos, et al., 1986; Shortell and Hughes, 1988).
- length of stay (Flood, et al., 1979; Hughes, Hunt, and Luft, 1987); Gross, et al., 1980; Hobler, et al., 1984; Goldfarb and Coffey, 1987).

Not addressed in the literature review but intuitively logical as correlates of adverse outcomes are the number of actions taken by the state peer review organization (PRO) against physicians with privileges in the hospital and against the hospital itself. A PRO is charged with assuring that quality hospital care is provided to Medicare beneficiaries, therefore, actions by an organization to change the physician's or hospital's behavior in order to meet a predetermined standard suggests a deficient quality of care.

Summary

As the review of literature has demonstrated, quality of care research is varied and extensive in many areas, but less prolific in other areas. This research examines not only how the hospitals' size and specialization affect both the quality assurance subunit's structure and function and adverse outcomes, but also how the quality assurance subunit's structure and function affect adverse outcomes.

The significance of this research is seen in four basic areas. First, this research has chosen to limit the choice of contextual variables to size and specialization which are then measured using multiple indicators. This allows a refinement of the measurement of the impact of context on quality assurance design and resources and adverse outcomes.

Second, this research studies quality assurance design and resources, which are more closely linked to the outcome than are hospital characteristics. It is believed that the subunit will be more influential than the larger organization's characteristics.

Third, the measure of adverse outcomes of hospitalization is a more refined measure. Multiple indicators representing the major providers of care as well as support services are used to measure adverse outcomes. In addition, the term adverse outcomes accurately reflects what is being measured.

Fourth, Congress has mandated its agencies to study outcomes as a measure of organizational function. The timeliness of the present research is therefore evident.

This research offers the opportunity to explore and hopefully gain some understanding of how a mechanism intended to improve or maintain quality actually functions. Knowledge gained regarding this could assist in the design of mechanisms that are more effective in assuring quality.

CHAPTER 4

METHODOLOGY

This study examines the effects of structural integrity and functional adequacy of quality assurance structures on adverse outcomes of hospitalization. The hospital is the unit of analysis. This chapter will address the analytical model, its specification, and measurement. Data sources and an analytical plan are presented.

Quality Assurance, Hospital Context and Adverse Outcomes

As stated in the literature review in Chapter 3, the research on quality assurance mechanisms and their impacts on quality of care is relatively limited.

The limited quality assurance literature indicates that increased formalization and standardization with greater discretion for line personnel may enhance the quality of the output. The relationships between the extent of these organizational characteristics and the level of specialization of quality assurance personnel and the organization's commitment to quality assurance are not well defined. However, literature from non-health care organizational research suggests that organizational commitment is essential to effective quality assurance

function, while the effect of increased formalization and standardization is less clear. It is also evident that the size of the hospital and its degree of specialization will likely affect both the structure of and the resources allocated to the hospital quality assurance program and the rate of adverse outcomes.

The quality of care literature supports the impact of organizational structure on a variety of outcomes. The use of multiple indicator measures of outcome offers the opportunity to examine the integrity of outcome-based measures of quality as compared to the use of a single quality indicator approach.

The paucity of research on how quality assurance structure and resources impact adverse outcomes highlights the need for empirical inquiry in this area. This research is intended to answer some important questions raised regarding the effectiveness of QA mechanisms.

Study Design

This is a cross-sectional study of the impact of quality assurance structure and function on adverse outcomes of hospitalization. Primary data were collected from seventy acute care general hospitals in the Commonwealth of Virginia (n = 70) that responded to a survey questionnaire. Specialty hospitals such as psychiatric, children's, and eye and ear, are eliminated due to the uniqueness of their patient population.

Structural and functional data of quality assurance subunits were identified for the last half of 1986. This time frame was imposed because the secondary data available for measuring adverse outcomes were limited to 1987-1988. Hospital attributes and structural data for 1986 were used. It is believed that there is a time lag between the point an organizational form is instituted and the point at which its impact has filtered through the organization to affect outcomes (Kaluzny and Veney, 1980, p. 342; Shortell and Kaluzny, 1983, pp. 397-403).

Data Sources

There are six sources of data used in this study. First is the Medicare hospital mortality rate for 1987 computed and published by the Health Care Financing Administration. The actual Medicare mortality rate represents "the percentage of each hospital's Medicare patients who died within 30 days of the admission that resulted in the last-occurring discharge of the patient" (HCFA, 1987, p. vi) during the study year. The range for predicted mortality gives "an estimate of mortality rates for cases equal in number and with the average characteristics treated by the hospital. The range is derived in part by determining the contribution to the probability of dying associated with various patient characteristics based on national experience: the number of high, low, and undefined risk hospital admissions in the

of up to four of six possible comorbid conditions--cancer, chronic cardiovascular disease, cerebrovascular disease, chronic liver disease, diabetes, hypertensive disease--and by applying weights of the risk factors to the actual number of patients at the hospital to enable compilation of an expected mortality rate" (HCFA, 1987, p. vi-vii). This rate is then adjusted for variability due to the given number of cases after which it is then presented as a range of predicted mortality rates. The fewer the number of cases in each category, the wider the range of the predicted mortality rate. Conversely, larger numbers of cases result in greater precision with correspondingly smaller ranges.

Second, the American Hospital Association's (AHA) file containing hospital attributes in 1987 is used. The data were gathered from AHA hospitals that returned the survey questionnaire mailed to them. Although the information is referred to as pertaining to 1986, 27.3 percent of responding hospitals used a reporting period of July through June, or half of 1986, and 42.4 percent used a reporting period of October through September, or nine months of 1986. For numbers of beds and bassinets, the most recently reported information to the American Hospital Association was used. Facilities and services and inpatient service area data include only reporting hospitals.

Third, the 1986 case-mix index for the study hospitals is compiled from the Federal Register. The case-mix

measure, which is a measure of variation in resource consumption, is the diagnosis related group-based case mix index for each hospital in the study. The DRG-based case mix index is a ratio of each hospital's DRG-weighted expected cost per case to the national expected cost per case. Values greater than one indicate a more costly mix of patients than the national average; less than one, a less costly case mix. Controlling for case mix allows a comparison of mortality rates among hospitals because the hospital's average product can then be judged on equal terms.

Fourth, data regarding length of stay, sex and age composition, proportion of surgical patients, proportion of patients transferred to the hospital, outliers by length of stay and costs, rate of post-operative complications, rate of in-hospital traumas, rate of patient readmissions within 15 days, rate of nosocomial infections, rate of corrective actions against the hospital and physicians at the study hospital by the state peer review organization were obtained from the Medical Society of Virginia Peer Review Organization (MSVRO). The data from the MSVRO represent a 3% random sample of Medicare patients by hospital, plus all pacemaker patients, all patients discharged against medical advice, and all patients with diagnoses with high rates of transfer.

Fifth, data regarding quality assurance structure and function were obtained by a questionnaire, mailed to 97

Virginia hospitals in 1987. This survey incorporated selected questions on the degree of the QA mechanism's standardization, formalization, complexity, hierarchy of control, specialization of personnel, perceived organizational commitment, and perceived location of operational control. The basic questions, on organizational structure, were adopted from Van De Ven and Ferry (1980) study in which the Organizational Assessment Instruments (OAI) were used to assess the work unit or department. A complete discussion of the OAI construction and testing can be found in Van De Ven and Ferry (Chapter 5, 1980). Tests of reliability and validity for the original questions were satisfactory (Van De Ven and Ferry, 1980, p. 189-202).

In the conduct of the organization survey, a two- stage method of questionnaire distribution was utilized. First, a questionnaire (see Appendix A) was distributed to all persons attending the Spring meeting of the Virginia Association of Quality Assurance Professionals (VAQAP) (n = 50) in Newport News, Virginia. A brief explanation of the focus of the questionnaire was given. The researcher was available to answer any questions and receive completed questionnaires. Three completed questionnaires were returned at that time. For all hospitals that did not have a completed questionnaire returned to the investigator within seven days of the VAQAP meeting and for all other short-term general hospitals in Virginia not represented at

the VAQAP meeting, a questionnaire was mailed to the person who supervises quality assurance activities on a daily basis. Names of QA supervisors were obtained by calling the QA department at each hospital. After seven days, a second questionnaire was sent to those nonrespondents. After an additional ten days, those who did not respond were contacted by the investigator. If the quality assurance supervisor agreed, a telephone interview was conducted at that time (n = 1).

Seventy completed questionnaires (n = 70), from seventy hospitals were usable with a completion rate of 72.17%. Among the non-respondents, five hospitals informed the investigator that corporate policy prohibited their participation in the study.

Sixth, data regarding occupational distributions of workers, by county, were obtained from the Virginia Statistical Abstract (1987 ed.) The number of workers employed in farming, forestry, and fishing and the total number of persons employed were obtained.

The unit of analysis in this study is the hospital. Adverse outcomes of hospitalization are the dependent variable, while quality assurance unit design and resources, and organizational size, and specialization are the independent variables. Hospital ownership, geographic location, and competition are used as control variables. A detailed list of the variables and their definitions can be

found in Table 2.

Size and Specialization Variables

Three variables are used to measure hospital size. These are the number of beds the hospital (HOSPBDN), the non-capital expenditures (EXPEND) that includes total payroll expenses, employee benefits, and professional fees, and, the total hospital full-time equivalents (FTEH).

Specialization is measured by six variables. PCTRN is a measure of the number of on the hospital's nursing staff. It is defined as the number of registered nurses divided by the total number of hospital nursing staff, times one hundred. SPECARE is the number of special and intensive care beds in a hospital. It includes medical, surgical, burn, coronary, neonatal, pediatric, and other special care beds. MIX is the 1986 HCFA DRG-based hospital case mix index. BRDCERT is the percent of board certified physicians on a hospital's staff. This is defined as the number of board certified physicians on staff divided by the total number of physicians on staff times 100. PCTSURG is the percent of total patients undergoing surgery. This is operationalized as the number of patients with surgical DRGs divided by the total number of patients times 100.

TRANSIN is a measure of the percent of patients transferred to the hospital from other sources. This is defined as the number of patients transferred in divided by the total number of cases reviewed times 100. Several

TABLE 2 List of Variables and Their Definitions

Variable	Code	Definition
Size (S_i)		
S_1	HOSPBDN	hospital bed size (number of staffed beds)
S_2	EXPEND	non-capital expenditures (total)
S_3	FTEH	total full-time equivalents in the hospital
Specialization (L_i)		
L_1	PCTRN	Percent RNs in a hospital (number of RNS/total number of nursing staff x 100)
L_2	SPECARE	number of special care beds in a hospital
L_3	MIX	1986 HCFA DRG-based hospital case-mix index
L_4	BRDCERT	percent board certified MDs practicing in a hospital
L_5	PCTSURG	percent of total patients undergoing surgery
L_6	TRANSIN	percent of admissions transferred in from other sources = number of patients transferred in/total number cases reviewed x 100.

(Table 2 Continued)

Variable	Code	Definition
Adequacy of QA Design and Resources (D_i)		
D_1	PLICENSE	number of QA personnel holding licensure as a registered nurse
D_2	EDUCATON	number of personnel holding an educational degree above the associate degree
D_3	PERSONAL	total number of QA personnel/total hospital FTEs
D_4	PROPT	total number of professional QA personnel/total FTEs hospital
D_5	DISCRETN	measure of discretion allowed QA personnel in performing their work
D_6	QATROL	QA personnel's perceived appropriateness of the QA unit's control over their functioning
D_7	FORMAL	extent of formalization
D_8	QASPREAD	extent of QA involvement in hospital-wide quality assurance activities
D_9	SATISF	perceived organizational commitment to QA by QA personnel

(Table 2 Continued)

Variable	Code	Definition
Adverse Outcomes (A_i)		
A_1	COMPRATE	postoperative complication rate = number of patients with unexpected return to the OR/ total number of cases reviewed
A_2	TRAUMAR	in-hospital trauma rate = number of in-hospital traumas/total number cases reviewed
A_3	TXPROBR	rate of treatment problems = number of patients reviewed with a problem related to a treatment or medication change/total number cases reviewed
A_4	MEDPROBR	medical instability rate = number of patients reviewed with medical instability at time of discharge/total number patients reviewed
A_5	DEDPROBR	rate of unexpected deaths = number of unexpected deaths/total number of cases reviewed

(Table 2 continued)

Variable	Code	Definition
Unobserved Concepts		
Exogenous		
(ξ_1)	SIZE	hospital size (latent variable)
(ξ_2)	SPECIAL	hospital specialization (latent variable)
Endogenous		
(η_1)	AQADR	adequacy of quality assurance design and resources (latent variable)
(η_2)	AO	adverse outcomes of hospitalization (latent variable)
Control Variables		
C_1	OWNER	for-profit versus not-for-profit ownership of hospital
C_2	RURAL	percent of population in a county which is employed in agriculture, forestry or fishing.
C_3	COMPETE	competition among hospitals in a county = total number of inpatient days in a specific hospital/Total number of inpatient days in all hospitals in the county
C_4	ALOS	average length of hospital stay (days)
C_5	TEACH	extent of a hospital's commitment to teaching = number of teaching affiliations or programs at a hospital plus membership in the professional association of teaching hospitals.

variables which were originally considered were eliminated due to missing data, lack of variance, or failure to measure the concept.

Index Construction of Survey Data

The quality assurance questionnaire generates data for measuring numerous aspects of a quality assurance program's design and resources.

Table 2 presents the variables used to measure each of the constructs. Operational definitions for the variables are contained in this table.

Table 2 shows that the construct, Adequacy of QA Design and Resources, is measured by nine variables. The variables, PLICENSE and EDUCATON, represent information on the qualifications of the hospital's QA professionals. The data were initially alpha-numeric which necessitated their conversion to numeric. To measure the extent of clinically knowledgeable persons with a level of education deemed necessary for critical, evaluative analysis, the presence of licensure as a registered nurse and the holding of an academic degree above the associate degree were set as the criteria for inclusion. Both PLICENSE and EDUCATON were then given numeric values by assigning a value of one to each QA professional who met the above criterion. An index was constructed for PLICENSE by summing the number of QA professionals who were registered nurses. The EDUCATON index was constructed by summing all of the QA professionals

who held an academic degree above an associate degree.

The variables PERSONAL and PROPT are measures of personnel resources allocated to QA work. PERSONAL is the total number of QA FTEs divided by the total number of FTEs in the hospital. PROPT is the total number of professional QA FTEs divided by the total number of hospital FTEs.

DISCRETN is a measure of the discretion QA professionals use in performing their work. This variable is a summative index of six subareas, each rated on a five point scale, found in question 9 of the questionnaire. The question subareas were recoded to four point scale so that the presence of no discretion received no value (eg. zero score). The variable's possible score was zero to 24, with the higher number representing greater discretion.

QATROL is a variable designed to measure QA personnel's perception of the appropriateness of their control over their unit's functioning and the extent of administration's control over QA work. Questions 13 A, which poses this question, has a 5-point scale, which was recoded to allocate no-credit to the absence of perceived appropriateness of control.

Initially, a summative index was constructed with a 0 through 28 score encompassing six subareas. The index was modified to consider only influence by the professional subgroups. Support personnel were perceived to have no or little influence on the QA program and were therefore

eliminated from the index. It became apparent that the other professional groups and the Board of Trustees exert their influence through administration, therefore, organizational control was conceptualized as being that perceived to rest with the QA staff (QATROL) and that exerted by Administration (ADCONTRL). ADCONTRL was eliminated because it was not statistically significant. The greater the score the greater the perceived influence.

FORMAL, a variable which measures the extent of the QA programs formalization, is an index that was composed of the responses to three separate questions. Questions addressing the extent of QA standardization (question 6), QA formalization (question 7), and QA specificity (question 8) were summed to form the index. Each of the three questions had a five point scale which indicated the percent of their work controlled by the organization. The data were coded 1 to 5 with the greater number representing a larger portion of work being controlled.

The variable QASPREAD (question 5) measures the extent of QA involvement in hospital-wide quality assurance activities. A matrix representing twelve hospital QA related areas or committees and five QA roles or functions, was given for the respondent to indicate the services they provided each committee. They were also able to indicate that no services were provided. There was space provided for the respondent to list additional committees their program

serviced. Each role or function indicated received a value of one. When no services were provided a zero was assigned. The QASPREAD index is the summation of the number of roles or functions indicated. The summative index has a range of zero to 80.

SATISF (question 14 A,B,C) is a variable which measures the perceived organizational commitment to QA by QA personnel. This index measures the perceived adequacy of fiscal and personnel resources and the perceived commitment of management to QA. Each part of the question has a five-point scale. The higher the score the greater the satisfaction. The index ranges from 3 to 15. Several items were eliminated because they did not reflect the concept measured.

Adverse Outcome Variables

Six variables are used to measure adverse outcomes of hospitalization. COMPRATE is a variable which measures the rate of unexpected return to the operating room. This variable, as a measure of post-operative complications, is number of patients with unexpected return to the operating room divided by the total number of cases reviewed. TRAUMAR is a measure of the rate of in-hospital traumas, such as patient falls and medication errors. It is calculated as the number of in-hospital traumas divided by the total number of cases reviewed. As a measure of the rate of patient readmissions after hospital discharge, READRATE is

calculated by dividing the number of patient readmissions within 15 days of discharge by the total number of cases reviewed. TXPROBR measures the rate of treatment or medication problems. It is the number of patients reviewed with a problem related to a treatment or medication change divided by the total number of cases reviewed. MEDPROBR is a measure of the rate patients are medically unstable when they are discharged. It is calculated as the number of patients reviewed which were medically unstable at the time of discharge divided by the total number of patients reviewed. DEDPROBR is a variable which measures the rate of unexpected deaths among patients. It is calculated as the number of unexpected deaths divided by the total number of cases reviewed.

Unobserved Concepts

The unobserved exogenous concept size (SIZE) is measured by the number of staffed beds in the hospital (HOSPBDN), the hospital's total non-capital expenditures (EXPEND), and the number of total full-time equivalents in the hospital (FTEH). Specialization (SPECIAL), also an exogenous unobserved concept, is measured by the percent of registered nurses in a hospital (PCTRN), the number of special care beds in a hospital (SPECARE), the 1986 HCFA DRG-based hospital case-mix index (MIX), the percent of board certified physicians practicing in a hospital (BRDCERT), the percent of total patients undergoing surgery

(PCTSURG), and the percent of patients transferred into the hospital from other sources (TRANSIN).

The endogenous concept, adequacy of quality assurance design and resources (AQADR), is measured by the number of registered nurses in QA (PLICENSE), the number of QA personnel with an academic degree above the associate degree (EDUCATON), the ratio of total (PERSONAL) and professional (PROPT) full-time equivalents allocated to QA, the extent of discretion allowed QA personnel in performing their work (DISCRETN), QA personnel's perceived control over QA's functioning (QATROL), the extent of QA formalization (FORMAL), and the QA personnel's perceived commitment of the organization to QA (SATISF).

The endogenous concept, adverse outcomes of hospitalization (AO) is measured by the rate of unexpected returns to the OR (COMPRATE), the in-hospital trauma rate (TRAUMAR), the rate of patient readmission within 15 days of discharge (READRATE), the rate of treatment or medication error (TXPROBR), the rate of medical instability at discharge (MEDPROBR), and the rate of unexpected death (DEDPROBR).

Control Variables

The control variables are OWNER, which is a measure of whether the hospital is for-profit or not-for-profit; RURAL, which is a measure of the percent of persons in a county employed in agriculture, forestry, or fishing; COMPETE, a

measure of the hospital competition in the county in which the hospital is located; ALOS is the average length of patient hospital stays; and TEACH is the extent of a hospital's commitment to teaching.

Several variables which had originally been considered were dropped because they were not considered to measure the construct, or their lack of variance and extent of missing data made them inappropriate.

Analytical Model and Hypotheses

The analytical model hypothesizes that organizational size and specialization are related. They exert direct influence on adverse outcomes as well as an indirect influence on outcomes via the quality assurance department design and resources. Based upon the literature, the following specific hypotheses are generated regarding the influences of size and specialization on quality assurance and outcomes:

H_1: As organizational size increases, the quality assurance subunit will be a more self-sufficient subunit.

Increased self-sufficiency would include achieving departmental status, a full-time professional staff, and having a reporting responsibility to upper level management.

H_2: As organizational size increases, formalization of quality assurance activity increases.

This follows the first hypothesis indicating that the unit has grown to the point of subdivision. The organization will exert control by limiting the range of options available to the units' personnel.

H_3: As hospital specialization increases, formalization of quality assurance activity will increase.

The impact on quality assurance subunit design of increasing specialization is expected as a result of increasing complexity and the need to control behavior. As the hospital becomes more specialized, the results of increased numbers of specially educated personnel, special equipment and organization used to provide care to a target patient population should decrease adverse outcomes. Thus,

H_4: As hospital specialization increases, the incidence of adverse outcomes of hospitalization will decrease.

Quality Assurance Design and Resources

The model also indicates that the adequacy of organizational structure, measured by the quality assurance design and resources, affects adverse outcomes. The following hypotheses are generated regarding the effect of the design and resources of QA mechanisms:

H_5: The more formalized the quality assurance mechanism, the fewer the adverse outcomes of hospitalization.

H_6: The more extensive the QA program's involvement in hospital QA activities, the fewer the adverse outcomes of hospitalization.

H_7: The greater the perceived autonomy allowed quality assurance personnel in the performance of their work, the fewer the adverse outcomes of hospitalization.

These hypotheses address the belief that a QA program with an adequate staff and the authority to perform its functions in a timely manner will decrease the number of adverse outcomes. The presence of a QA program which interacts with many aspects of the hospital-wide QA program, allows for personnel who can focus on one job, quality assurance. It also allows them to gain an understanding of the hospital's quality assurance performance and, thus, establish legitimacy in quality assurance in the eyes of the rest of the hospital. Compatible with the need to facilitate the timely flow of information is the need to have an appropriate number of specially trained quality assurance personnel rather than numerous individuals with questionable quality assurance preparation.

Finally, there is a need for appropriate decentralization of decision making so that a timely conveyance of information to the proper decision makers (clinical or organizational) can be made. Research by Gertman and Egdahl (1978) and Restuccia (1982) supports the positive influence on quality of care of the placement of discretionary authority at the staff level.

H_8: The greater the quality assurance program personnels' perceived commitment by the organization and its members to quality assurance, the fewer adverse outcomes of hospitalization.

H_9: The more perceived control of QA functioning available to quality assurance personnel, the fewer adverse outcomes of hospitalization.

These hypotheses address the ability of the structure established for quality assurance activity to actually perform the tasks it is charged with, within the scope of the resources provided by the hospital. The contingency perspective is such that if the quality assurance mechanism's design and resources were appropriate for the context in which the subunit functions, its effectiveness is enhanced and a smaller number of adverse outcomes are observed.

Statistical Analyses

The analyses of the data include descriptive and confirmatory statistical analysis. The data are described using means, standard deviations, and zero order correlations. Each continuous variable is examined for its distributional normality.

Exploratory analyses include the use of general linear model analysis of variance (ANOVA) and simple regression. ANOVA is an exploratory statistical technique which tests the null hypothesis that the means of the groups are equal (i.e., there is no statistical difference between the group means). ANOVA requires that dependent variables are continuous, independent of each other, and normally distributed. It requires that independent variables be categorical; and the groups be of approximately equal size.

ANOVA is used to explore differences between participant and non-participant hospitals which presents a situation of unequal group sizes. For this reason, general linear model analysis of variance for unequal group sizes is used.

General linear model simple regression is used to explore the influence of size and specialization variables on adverse outcomes of hospitalization. Simple regression is used because of the high intercorrelation of the size and specialization variables. Data are normalized where required and possible. Attached is a summary that describes the non-normalized variables (Appendix B).

The analytical model is tested using the Linear Structural Relations (LISREL) approach. The following section will discuss the use of LISREL.

Analytical Plan

The confirmatory analysis of the data is performed using a linear structural relations approach (LISREL). The theoretical model has been constructed using multiple, correlated variables to measure underlying constructs. LISREL permits the testing of such conceptualizations by using proxy measures and by estimating measurement error. Thus, LISREL is used due to the intercorrelations among the independent variables, and to identify the presence of underlying unobservable constructs. For instance, the concept size, which has no agreed upon measure, is measured using the proxy measures of the number of hospital beds

(HOSPBDN), non-capital expenditures (EXPEND), and total full-time equivalent personnel (FTEH). LISREL allows not only the use of these three correlated variables to measure the concept, but also tests the goodness-of-fit of the measurement model for the underlying constructs before they are included in the structural equation. Finally, LISREL can detect the presence of correlated errors for the multiple measures. The LISREL model consists of two components--the measurement model and the structural equation model. The measurement model specifies the relationships between observed variables and unobserved, theoretical concepts (i.e., latent variables), producing measurement errors for each. The structural equation model specifies causal relationships among the endogenous and exogenous variables.

Measurement Models

This research has three measurement models for the exogenous variables which show the relationship between the observed exogenous variables and the unobserved theoretical concepts (Figures 4 through 6). As supported by the literature review, organizational size is measured by hospital bed size (HOSPBDN), total non-capital expenditures (EXPEND), and total full-time personnel (FTEH). Hospital specialization is measured by the percentage of RNs (PCTRN), the number of special care beds (SPECARE), hospital casemix (MIX), percent board certified physicians (BRDCERT), percent

Figure 4. Measurement model of the construct hospital size (SIZE).

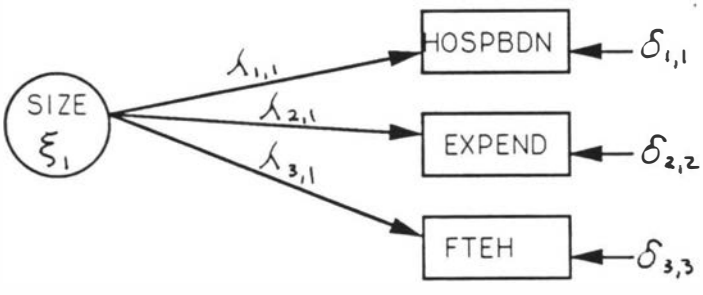


Figure 5. Measurement model of the construct specialization (SPECIAL).

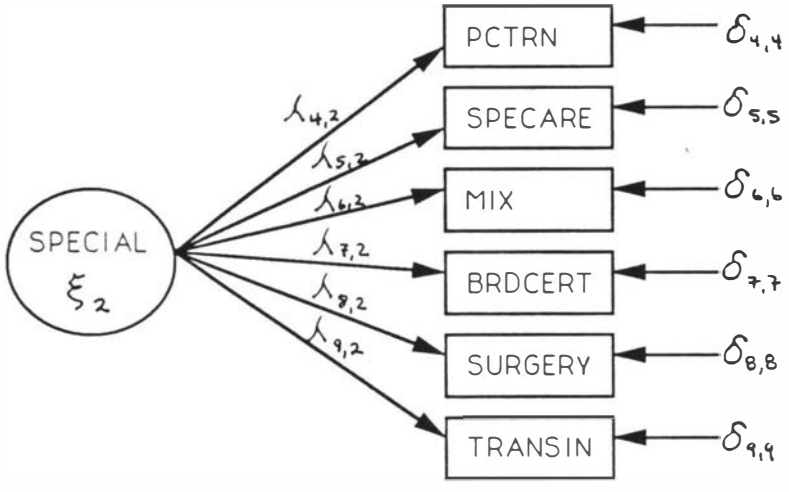
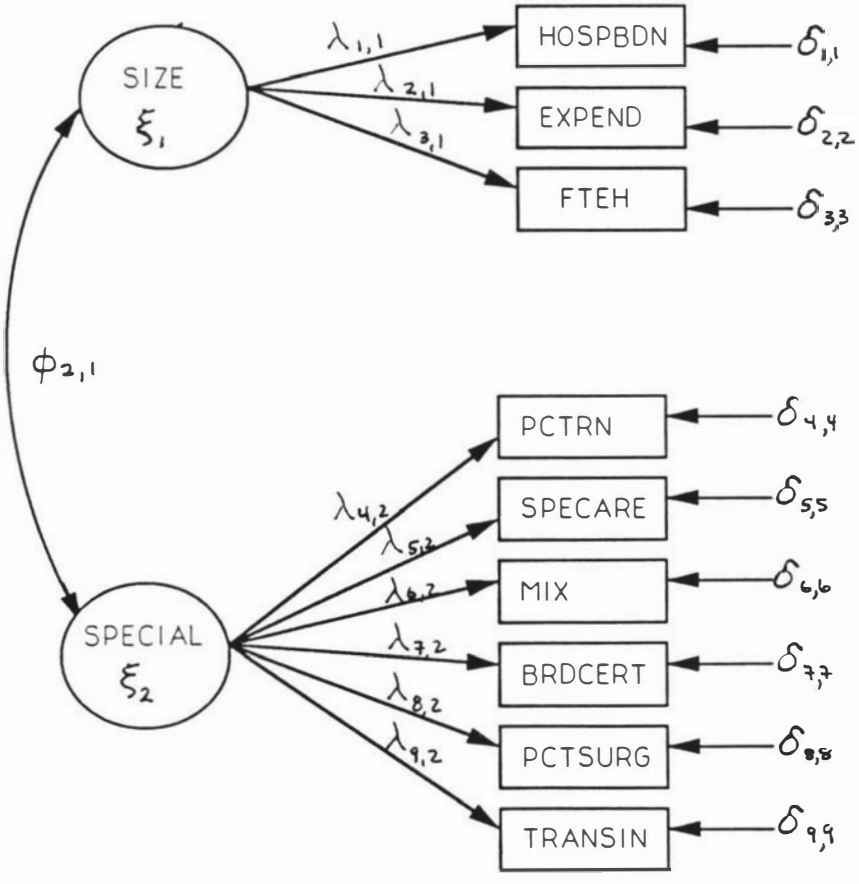


Figure 6. Measurement model for the two organizational constructs size (SIZE) and specialization (SPECIAL).



of total patients undergoing surgery (PCTSURG), and percent of admissions transferred in from other sources (TRANSIN). The two constructs--size and specialization, are assumed to be correlated and are presented as such in Figure 6. For the endogenous variables, there are three measurement models (Figures 7 through 9). The adequacy of quality assurance design and resources, an unobserved construct, is measured by the observed variables, the number of registered nurses in QA (PLICENSE), the number of QA personnel with an academic degree above an associate degree (EDUCATON), the extent of discretion allowed QA personnel in performing their work (DISCRETN), the extent the QA program is involved in the hospital-wide QA activity (QASPREAD), degree of formalization (FORMAL), perceived organizational commitment to QA (SATISF), the ratio of total QA personnel to total full time equivalents (PERSONAL), the ratio of professional QA personnel to total full-time equivalents (hospital) (PROPT), and the QA personnel's perceived appropriateness of QA unit control (QATROL). Adverse outcomes of hospitalization are measured by the unexpected return to the OR (COMPRATE), in-hospital trauma rate (TRAUMAR), readmission rate (READRATE), the rate of treatment or medication problems (TXPROBR), the rate of patient medical instability at discharge (MEDPROBR), and the rate of unexpected deaths (DEDPROBR). All of these variables are supported in the literature. The measurement model relating

Figure 7. Measurement model of the adequacy of quality assurance design and resources.

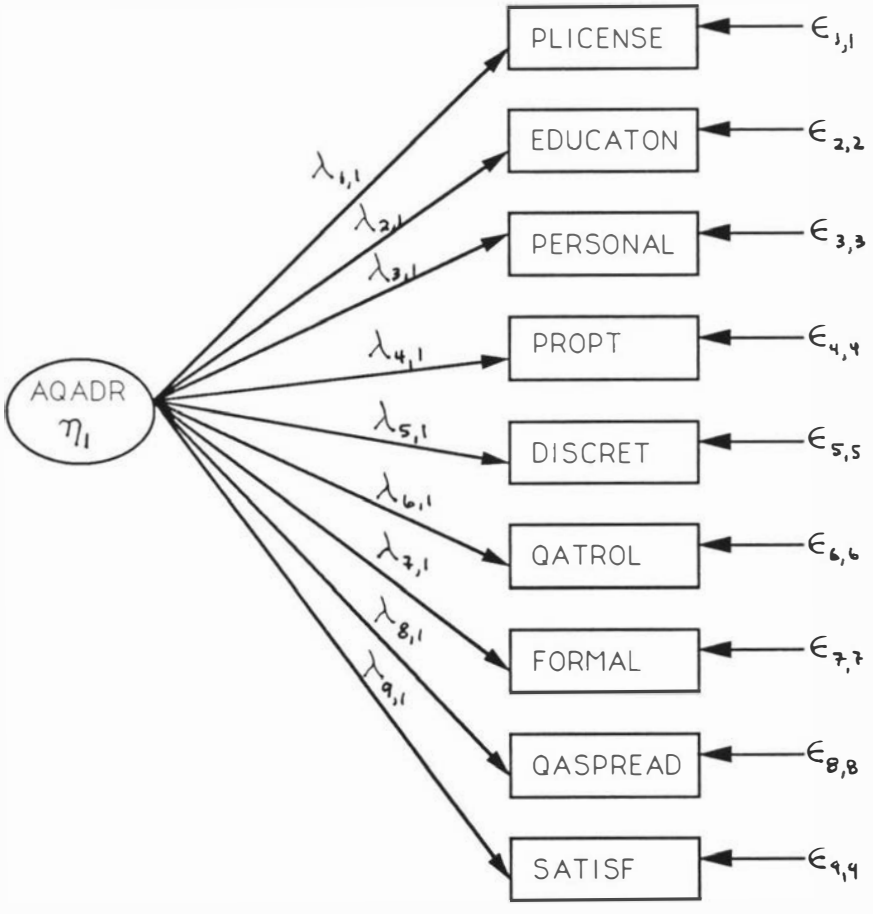


Figure 8. Measurement model of adverse outcomes of hospitalization.

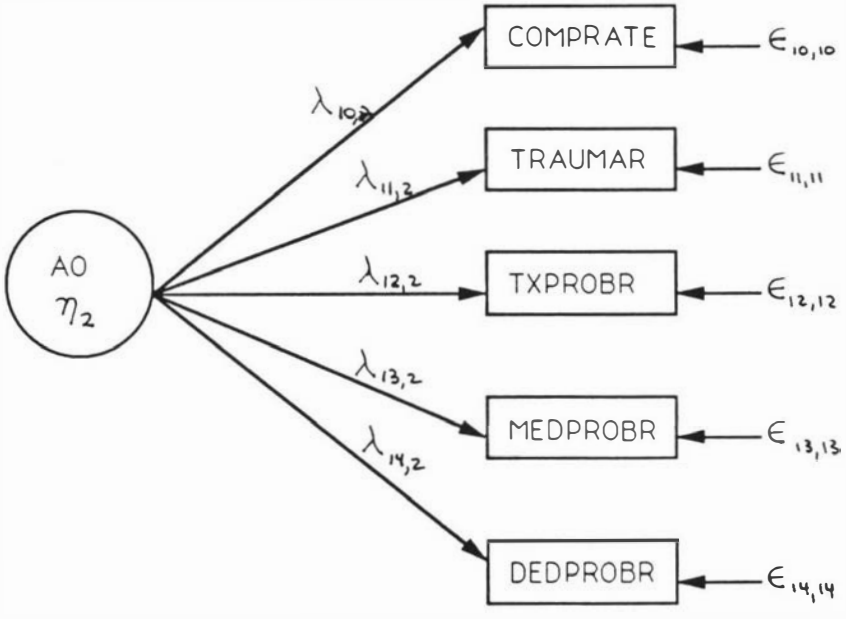
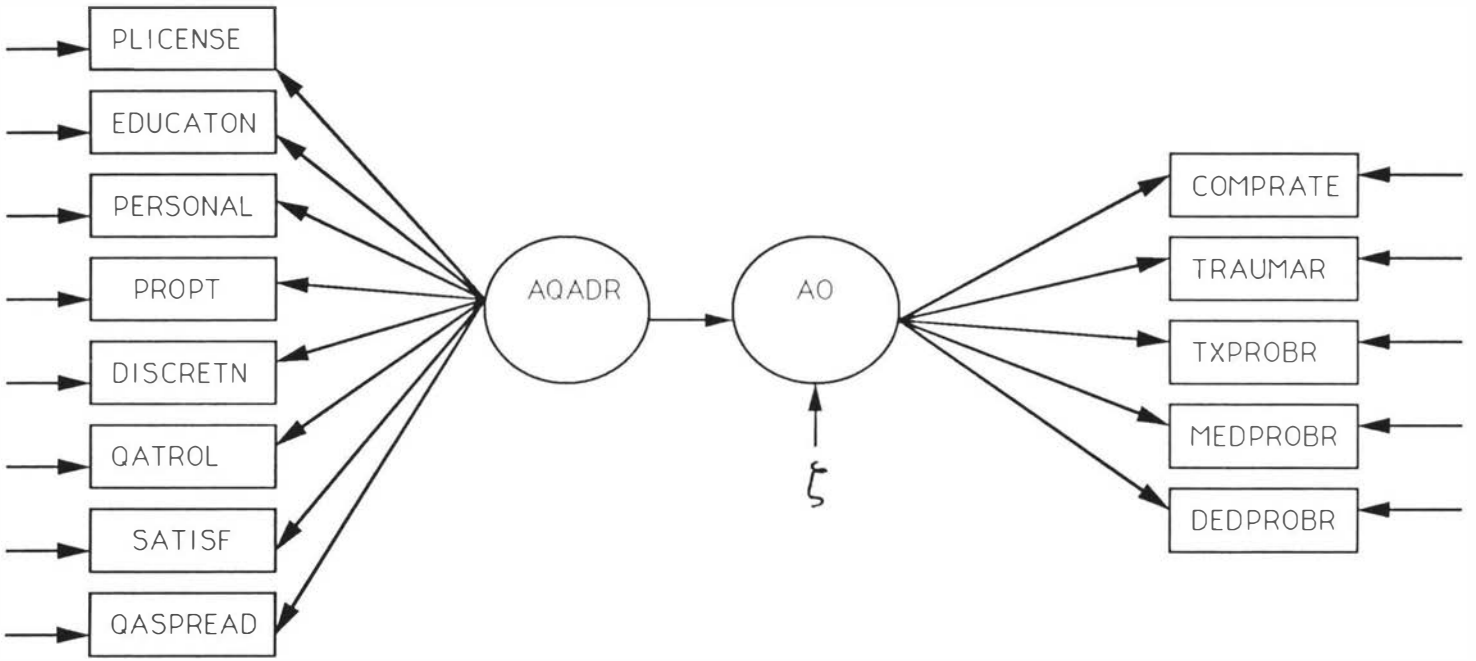


Figure 9. Causal model of the endogenouse concepts of adequacy of quality assurance design and resources and adverse outcomes of hospitalization.



the two endogenous concepts is presented in Figure 9.

Structural Equation Model

"The second component of the covariance structure model is a structural equation model causally relating the latent variables that have been factored from observed variables through a measurement model" (Long, 1983, p. 25). In this research, the structural equation model determines the causal linkages between (a) the exogenous organizational variables (exogenous variables) and the adequacy of quality assurance structural and functional attributes (endogenous variables); and (b) the adequacy of QA design and resources and the dependent variable, adverse outcomes. The structural equation model is presented in Figure 10.

Model Specification

The LISREL model is a multivariate analysis of covariance structure which explains the relationships among multiple observed unobserved variables (Long, 1983, p.11). It is assumed that the unobserved variables or constructs have a common variance shared by the observed variables. The measurement model links the observed variables with unobserved variables. The structural equation model relates the causal link between observed exogenous and unobserved endogenous constructs or variables.

Measurement models have two basic equations:

$$\chi = \Lambda_x \xi + \delta \qquad [1]$$

and

$$y = \Lambda_y \eta + \epsilon \qquad [2]$$

In the first equation, observed variables, χ, are linked to the latent exogenous variables, ξ, by the Λ_x matrix. The Λ_x matrix contains the loadings, or measures of influence, of the unobserved ξ on the observed χ. Due to errors in measurement of χ, the error term, δ, is included.

The second equation links the observed y-variables with the unobserved endogenous concepts, η, by the loading matrix Λ_y. The error term, ϵ, represents measurement error in y.

Figure 4 is the measurement model for the exogenous variable size. In this model, the three independent, observed variables (χ), indicated by boxes, are shown to be the measurement variables for the unobserved, latent concept (ξ) size. The error term, δ, indicates that the observed variables are measured imperfectly. The notations, Λ_{ij}, on the single headed arrow between the (χ) variables and the ξ are the factor loadings, which indicate how a change in size affects the observed variable (χ). Figure 5 can be interpreted in a similar fashion for specialization.

For the endogenous variables, η_i, a similar interpretation is made except the unobserved concept is

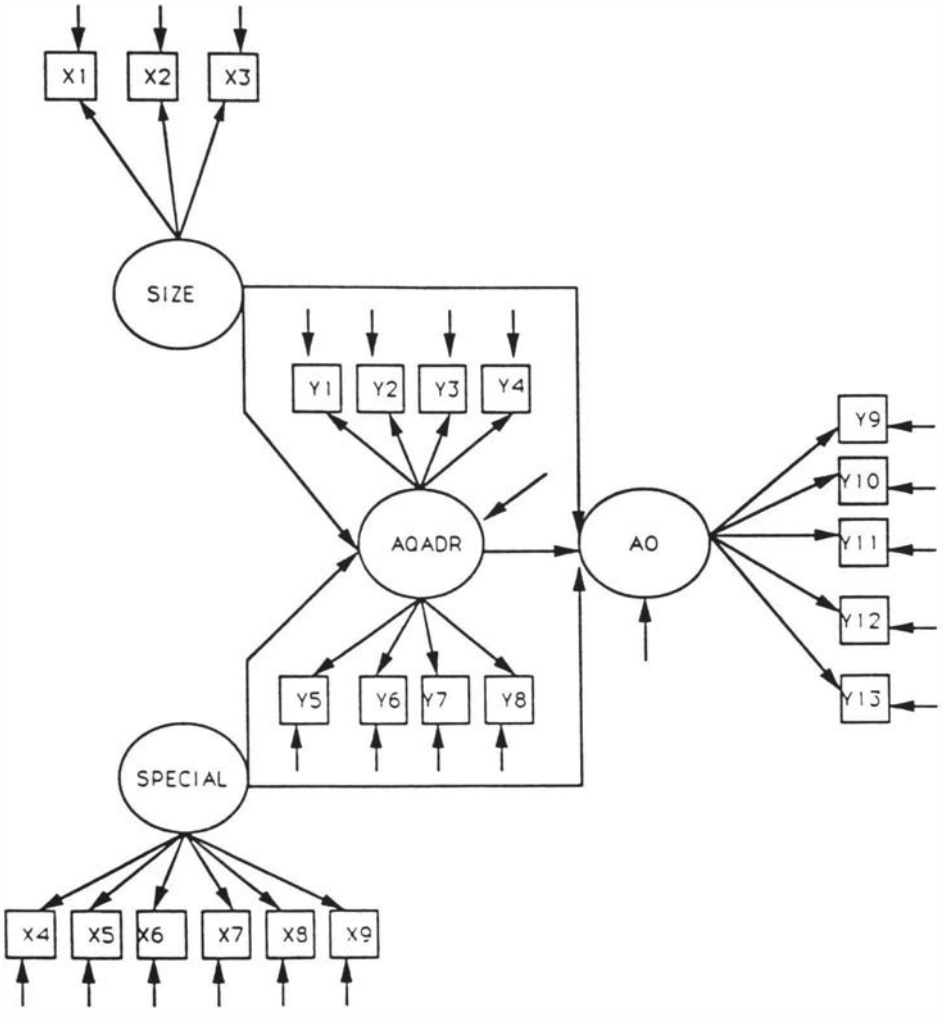
(η); the observed variables (y) and the error term (ϵ). The error terms for the endogenous unobserved concepts (ζ_i) represent errors in the equation. The (β_{ij}) indicates the direct effect of one unobserved endogenous concept on another. Figures 7 through 8 represent the measurement models for the endogenous variables.

Figures 6 and 9 show the relationships among the unobserved variables. Figure 6 shows the relationships between the exogenous concepts (ξ), size and specialization and their observable variables (x_i). The factor loadings, λ_{ij} , and the error terms, δ_i , are interpreted as previously discussed. The double headed curvilinear arrow, ϕ_{12}, represents the covariance between the two exogenous concepts.

Figure 9 presents the relationships among the two endogenous concepts (η_i) and their respective observable variables (y_i). The single headed arrows pointing from one endogenous variable to another, β_{ij} , represent the relationship between two endogenous variables. The error terms, ζ , recognizes errors in the equations.

Figure 10 presents the structural equation model and the measurement model in a single LISREL model. (ξ_1) is causing X1, X2, and X3; (ξ_2) is causing X4 through X9. The arrows from the (ξ_S) to the (Xs) indicate the effect of (ξ) on (Xs) - (λ). The double headed curvilinear arrow represents the correlation between exogenous variables

Figure 10. Structural equation model.



(ϕ). The single headed arrows from an exogenous concept (ξ_i) to an endogenous concept (η_i) represent the causal linkage between the exogenous and endogenous concepts γ_{ij}.

The two endogenous concepts (η_1, η_2) are shown to cause the respective observed variables (y_{ij}). The (β) indicates the relationship between two endogenous variables. The (ζs) represent errors in the equations.

The structural equation model shows that the two exogenous concepts, size (ξ_1) and specialization (ξ_2), both directly and indirectly through quality assurance design and resources (η_1) affect adverse outcomes of hospitalization. In addition, the adequacy of quality assurance design and resources (η_1) directly affects adverse outcomes (η_2). The generic mathematical equation representing the structural equation model is:

$$\eta_2 = \beta(\eta) + \Gamma(\xi) + \zeta$$

Using 0.05 or lower as the level of statistical significance, the following mathematical model will be empirically tested:

$$\eta_2 = \beta_{21}\eta_1 + \delta_{11}\xi_1 + \delta_{21}\xi_1 + \delta_{12}\xi_2 + \delta_{22}\xi_2 + \zeta$$

Goodness of fit statistics produced by LISREL include Chi-square/degree of freedom ratio, goodness of fit index, and adjusted goodness of fit. These statistics indicate how well the data fit the model being tested. They do not

indicate the appropriateness of a theoretical model but indicate if the data being used support the model.

Summary

This cross-sectional study of the adequacy of quality assurance structure and function on adverse outcomes of hospitalization offers a unique methodological approach. It uses multiple indicators to describe the relationships of 1) organizational size and specialization, and, 2) quality assurance design and resources to adverse outcomes of hospitalization. The use of this statistical method which allows the exploration of the causal nature of the variables provides the opportunity to understand how the chosen hospital contextual variables affect quality assurance mechanisms as well as how quality assurance mechanisms affect adverse outcomes of hospitalization. This approach offers the potential for valuable insights into how the design and resources of mechanisms charged with ensuring quality care impact adverse outcomes.

In Chapter 5, the data, regarding participant and non-participant hospitals, and the relationships between hospital size and specialization and the adequacy of design and resources of QA programs are presented. Their interpretation and discussion are also presented in Chapter 5. Then the findings regarding the influence of QA design and resources on adverse outcomes are reported in Chapter 6.

CHAPTER 5

HOSPITAL SIZE, SPECIALIZATION, AND QA DESIGN AND RESOURCES

Chapter 5 explores the data regarding those hospitals participating in the study (participants) and those not participating (non-participants), and the relationship between the hospital's size and specialization and the form the QA program has taken. This will be accomplished using descriptive and exploratory statistical analyses.

Descriptive Statistics

Of the ninety-seven short-term acute care hospitals in the Commonwealth of Virginia sent questionnaires, seventy useable responses (n = 70) were received with a return rate of 72.17%.

Hospitals. The participating hospitals in the survey were compared to those not participating by means of analysis of variance (ANOVA) with unequal cells. Table 3 presents the ANOVAs results of the comparison between participant and nonparticipant hospitals. No statistically significant differences were found between the two groups in terms of bedsize, full time equivalents (FTEs) for the entire hospital, case mix, number of special/intensive care

TABLE 3 Characteristics of Participant (P) and Non-Participant (NP) Hospitals in the Study of Quality Assurance Programs.

Variable	Participant N	Participant Mean	Non-Participant N	Non-Participant Mean	F(p)
HOSPBDN	54	225.15	34	214.24	.09(0.76)
EXPEND (in 000s)	58	29,121.74	36	28,654.11	0.01(0.94)
FTEH	58	686.85	36	660.81	0.03(0.86)
PCTBRD	58	69.40	36	70.36	0.06(0.80)
SPECARE	54	19.56	34	19.32	0.00(0.97)
PCTRN	58	71.13	36	74.48	1.17(0.28)
MIX	58	1.13	38	1.12	0.02(0.89)
ALOS	58	8.59	39	8.72	0.13(0.72)
RURAL	60	0.033	20	0.035	0.03(0.86)
OWNER **	58	0.237	36	0.245	0.96(0.33)
COMPETE	54	0.49	34	0.42	0.59(0.44)

Notes:
* $p < .05$
** For-profit=1
Not-for-profit=0

beds, hospital expenditures, average length of stay, hospital ownership, percent of board certified physicians, percent of registered nurse staff, hospital competition, or rurality.

Quality Assurance Programs. The structure of quality assurance programs varies greatly. Table 4 presents the data describing the means for QA programs' characteristics, showing how the programs differ in their structure and functions.

The average QA program has approximately 1.4 registered nurses with one QA professional having a baccalaureate degree or higher. The average hospital QA program receives 4 FTEs for every 1,000 FTEs in the hospital, with 3 FTEs per 1,000 FTEs being QA professionals. The average QA program is perceived to have a moderate amount of discretion in performing its work (15.19/24) and a moderate amount of control over its own functioning (2.57/4). The average QA program also has a moderate degree of formalization (10.28/15). When the extent of QA activities within the hospital is examined, the average hospital appears to significantly limit the scope of its QA program's activities (28.46/80). The QA personnel perceive that hospital administrators were not committing many resources to QA and also indicated that they were moderately unsatisfied with the level of hospital commitment to their programs.

TABLE 4 Characteristics of Quality Assurance Programs by Attributes

Variable	n	mean	SD	minimum/ maximum
RANGE				
Quality of Resources				
Professional Licensure (Range=0-6)	70	1.357	1.373	0/6
Education (Range=0-6)	70	1.043	1.345	0/6
Quantity of Resources				
Total Personnel (Range=0-1)	63	0.004	0.003	0/0.012
Professional personnel (Range=0-1)	63	0.003	0.002	0/0.008
Autonomy				
Professional Discretion (Range=0-24)	67	15.194	5.983	0/24
Perceived QA control (Range=0-4)	62	2.565	1.250	0/4
Organizational Structure				
Extent of Formalization (Range=3-15)	64	10.281	3.844	3/15
Coordination				
Extent of QA activities within the Hospital (Range=0-80)	70	28.457	16.333	0/80
Commitment				
QA personnel's perceived commitment of management to QA activities (Range=3-15)	62	6.219	2.251	3/13

Factor Analysis of the Adequacy of Program Indicators

A factor analysis of QA program indicator was performed to explore whether the questions measured the proposed underlying concepts and, if so, what variables measured the specific underlying concept. This is an exploratory use of factor analysis. Both the orthogonal and oblique rotations produced a five factor solution. The variables in each factor were the same regardless of rotation methods used. Table 5 shows the orthogonally rotated factor pattern. Factor I is comprised of the variables DISCRETN (extent of perceived discretion in decision making accorded QA program by QA personnel), QATROL (perceived control of QA program by QA personnel), FORMAL (extent of formalization of QA program), and SATISF (extent of QA personnel's satisfaction with organizational commitment to QA). Factor II is comprised of PERSON (total number of FTEs in QA/Total number hospital FTEs), and PROPT (number of FTEs for professional QA personnel/Total number hospital FTEs). Factor III encompasses PLICENSE (number of registered nurses in QA) and EDUCATON (number of QA professionals with educational degree above an associate degree). Factor IV is QASPREAD, a measure of the extent of QA involvement in hospital-wide quality assurance activities. Factor V is composed of ADCONTRL (a measure of perceived administrative control over the QA programs activities) and REPORTS (a measure of the level in the hospital's hierarchy to which the QA program

TABLE 5 Factor Analysis of Quality Assurance Indicators (Orthogonal Rotation)

	ROTATED FACTOR PATTERN				
Variable	Factor I	Factor II	Factor III	Factor IV	Factor V
PLICENSE	-0.03126	0.20498	0.91439	-0.00842	0.00061
EDUCATON	0.12173	0.01768	0.89245	0.03823	0.09091
PERSONAL	0.10324	0.095922	0.18718	-0.05471	0.04881
PROPT	0.04941	0.77725	0.32552	-0.14915	0.14161
SUPPT	0.16472	0.67543	-0.15692	0.10434	-0.02609
DISCRETN	0.83176	0.14478	0.09333	0.15577	-0.01666
QUATROL	0.84453	0.03892	0.27187	0.21654	-0.00206
ADCONTRL	0.44094	-0.08320	-0.03964	-0.37238	0.62198
FORMAL	0.79569	0.12660	-0.10352	-0.04217	0.11079
REPORTS	-0.09143	0.15854	0.11661	0.23485	0.86561
SATISF	0.57186	0.17816	-0.31633	-0.49215	-0.00973
QASPREAD	0.23800	-0.01558	-0.03995	0.80884	0.08291
Eigenvalue	3.22	2.22	1.58	1.10	1.08
% Common Variance	34.92	24.10	17.14	11.93	11.71
% Total Variance	26.86	18.49	13.18	9.20	8.96

reports).

Five factors were accepted as reasonable based upon criteria suggested by Kim and Mueller (1979, p.43) and McCroskey and Young (1979, p.381). They suggest that one be used as the lowest acceptable eigenvalue a factor; and the point at which a scree plot levels off be the indicators for the number of factors. In addition, McCroskey and Young (1979, p. 380) suggest that a variable should have a primary loading of at least 0.60 and no secondary loading on another factor with a value above 0.40, if it is to be retained. All of these criteria were applied to the factor analysis.

Acceptance of the factors as composed is tempered by the realization that a correlation matrix based on a small sample may result in spurious correlations which can seriously distort the factor analysis. For this reason, some realignment of variables was undertaken based upon theoretical considerations.

Factor I, composed of DISCRETN and QATROL, measures the QA personnels' perceived control of their work-AUTONOMY. FORMAL is retained as a variable in Factor V which is a measure of organizational structure - ORGSTRUC. Factor II - QUANTPER - represents a measure of the quality of personnel resources which comprises the variables PERSONAL, PROPT, and SUPPT. Factor III, comprised of PLICENSE and EDUCATON, represents the quality of personnel resources available to perform QA work - QUALPERS. Factor IV - COORD - as measured

by QASPREAD, represents a concept of how extensive and influential the quality assurance program's presence is in the hospital's internal patient care monitoring structure. SATISF is retained as a single variable factor measuring the construct COMMIT.

The realignment of variables between factors is theoretically sound and justified based on concerns regarding spurious correlations possibly due to the limited sample size.

Based upon this rationale, LISREL is used to explore the causal relationships among the realigned variables in the five factors and their underlying constructs. The measurement model is used to explore the relationships among the QA indicators and their respective underlying constructs.

Hospital Size and Specialization

The contingency perspective, as discussed previously, recognizes that an organization's context can influence organizational structure and function. This study recognizes the importance of the hospital as the context within which the QA program exists, therefore, it is necessary to examine the relationship of some of hospital characteristics to QA programs. This study has chosen hospital size and specialization as the two major characteristics to be evaluated since it is believed that these two characteristics will be most influential in

causing QA design differentiation. This differentiation should impact on adverse outcomes. The large body of empirical research on both of these areas offers support for their use.

Hospital size. Three measures of hospital size are used. Hospital beds (HOSPBDN) is the number of staffed beds, as opposed to licensed beds. Total non-capital expenditures (EXPEND) is a measure of the hospital's financial outlay on non-capital needs. Total full-time equivalents (FTEH) is a measure of the total personnel resources used by the hospital. The intercorrelations of these variables are very strong, ranging from r = 0.906 to 0.975, which suggests that the size indicators are measuring the same concept. In order to avoid multicollinearity, only the variable HOSPBDN was retained as an indicator of hospital size.

Hospital specialization. Several measures of specialization are used. The percentage of registered nurses on staff (PCTRN) represents a measure of nursing staff specialization, as does the percent of board certified physicians on staff (BRDCERT). A count of the different types of special and/or intensive care units in a hospital (SPECARE) is a measure of the extent of specialization in the organization. The ratio of patients transferred into the hospital from outside sources (TRANSIN) also represents specialization. A count of the number of teaching

affiliations and membership in the professional association of teaching hospitals (TEACH) represents specialization of the hospital in the area of professional education. TEACH is a very skewed variable only applying to a few facilities. As with the size variables, but to a lesser degree, the specialization variables proved, for the most part, to be moderately to highly correlated (r = .326 to .789), therefore, one was chosen to represent the concept of specialization. BRDCERT was the variable chosen because it was the only variable which, when regressed on the outcome measure, proved to be statistically significant. No other variables representing either size or specialization were statistically significant (See Appendix C).

Size, Specialization, and QA Design and Resources

Using a general linear model, the relationships between the variables measuring hospital size, HOSPBDN, hospital specialization, BRDCERT, and the various measures of the QA program's design and resources are explored. Only six relationships prove to be statistically significant.

Size influences four areas of the QA program. It positively influences the number of registered nurses in a QA program (PLICENSE), and the number of QA personnel with education above the associate degree level (EDUCATON) and negatively influences the numbers of QA FTEs, both total (PERSONAL) and professional (PROPT). Specialization negatively influences the number of FTEs, both total

(PERSONAL) and professional (PROPT) allocated to QA.

The four quality aspects of the QA program affected by size suggest that as size increases the qualifications of the QA personnel increase (Appendix D). Additionally, as the size of the hospital increases, the ratio of FTEs, both total and professional, to total hospital FTEs decreases. In other words, the hospital allocates less personnel resources to QA work.

The two measures of personnel resource allocation to QA, PERSONAL and PROPT, are also affected by specialization (Appendix E). The relationships are negative in both cases which indicates that increased specialization result is associated with a decreased ratio of QA FTEs - both total and professional - to total hospital FTES, or less QA personnel as a part of the hospital staff.

These findings are unexpected in that increasing size increases the workload for QA personnel but the organization responds by decreasing the staff. This finding may mean that as the hospital size increases, QA becomes service-based rather than hospital-wide based. The licensure and educational responses to size suggest that more highly educated and clinically oriented individuals are assigned QA work perhaps reflecting the administration's emphasis on the value of QA. The organization's concern with QA is also reflected in the finding that the average QA program reports directly to individuals at the vice president or assistant

administrator level of the hospital (2.33/3). Although the average QA program has only 3 professional FTEs per 1,000 hospital FTEs, with only 1.3 of these being registered nurses, the data suggest that increasing size will increase the quality and quantity of the QA personnel in response to increasing demand.

The effect of specialization on the quantity of personnel allocated to QA suggests the need for differentiation within the QA program itself. It logically follows that as the care the hospital provides at the patient care level becomes more specialized and complex the need for increased numbers of professionals to monitor quality and support personnel to provide support services increases. Yet, these staff might be located at the service level rather than the hospital level. A proportional decrease in hospital QA personnel might be experienced as they are shifted to the unit level.

It is interesting and important to note that size and specialization were not statistically significant in influencing the discretion allowed QA personnel in performing their work (DISCRET); the QA personnel's perceptions of their control over their work (QATROL); the extent of formalization in the QA program (FORMAL); or the extent of QA involvement in hospital-wide QA activities (QASPREAD). Hospital specialization also did not affect the licensure or educational qualifications of the QA

professionals. This is an interesting finding in that it is contrary to what the contingency perspective would anticipate.

Hypotheses

The findings suggest that Hypothesis 1 regarding larger organizational size results in increasing self-sufficiency of the QA program is not fully supported. Although the number and qualifications of personnel increase with hospital size, it does not increase the discretion needed to do their work. The reported organizational level to which the QA program reports suggests that administration has direct oversight of the QA program.

Hypothesis 2 which states that larger organizational size results in increasing formalization of QA activities is not supported. Size was not statistically significant in affecting the extent of QA formalization ($F=1.26$, $p=0.39$). This may reflect the small variance in the size of QA programs and their degree of formalization. When the program is relatively small, control of the QA personnel is more easily exerted, therefore, increased formalization is not necessary. It may also reflect a narrowness in the scope of practice allowed the QA program. The variable QASPREAD, although not affected at a statistically significant level, suggests that the extent of QA responsibilities is very focused and narrow (28.46/80). Therefore, formalization of QA programs is not needed.

Hypothesis 3 states that increased specialization results in increased formalization. As with Hypothesis 2, the data do not support the hypothesis but suggest that the limited scope of a QA program's responsibilities may insulate it from many of the ramifications of organizational differentiation.

Hypothesis 4 which states that increased specialization results in decreased numbers of adverse outcomes is conditionally supported ($T = -2.11$ $p=0.009$) (Appendix E). The regression coefficient indicates that as BRDCERT increases the rate of adverse outcomes will decrease. Of all of the measures of specialization considered initially, only the percentage of board certified physicians on staff was statistically significant in accounting for variance in the adverse outcome variable. No other measure of specialization was significant. Thus, the support of the hypothesis must be conditional, since only an increase in BRDCERT accounts for a decreased incidence of adverse outcomes.

Summary

Analyses of the data describing hospitals both participating and not participating in the study, indicate that there are no statistical differences between the two groups. This permits the generalizability of the research to short term, acute care hospitals in Virginia.

When describing the characteristics of QA programs in

participating hospitals, it is evident that there is little variation in QA programs in short term, acute care hospitals in Virginia. This homogeneity limits the opportunity of studying the effect that variances in QA design and resources might have on adverse outcomes of hospitalization. Also of interest was the finding that although many QA programs report directly to relatively high administrative officers, the QA personnel felt that commitment of resources to QA was low, as was administration's commitment to the program.

Factor analysis of the adequacy of program indicators identified five constructs. Groupings of the variables were not completely consistent with theoretical expectations. In light of the small sample size, it was decided to regroup several of the variables. This was undertaken recognizing that a small sample size can cause spurious correlations which can result in unusual alignments of variables into factors. Regroupings were based on theoretical expectations.

Single indicators for size and specialization were used due to high intercorrelations of the variables measuring size (HOSPBDN), and the specialization (BRDCERT), in influencing the outcome measure. Intercorrelations among both the size and specialization variables were moderate to high.

Size was found to positively influence the number of

registered nurses in QA (PLICENSE) and the number of QA personnel with an academic degree above an associate degree (EDUCATON), and negatively influence both the ratio of total QA FTEs (PERSONAL) to total hospital FTEs and the ratio of professional QA FTEs (PROPT) to total hospital FTEs. Specialization negatively influences the ratio of total QA FTEs (PERSONAL) to total hospital FTEs as well as the ratio of professional QA FTEs (PROPT) to total hospital FTEs. These findings offered mixed support for the four hypotheses relating to size and specialization and their impact on the adequacy of QA design and resources and adverse outcomes.

Chapter 6 will explore the causal relationships between the adequacy of QA design and resources and adverse outcomes of hospitalization.

CHAPTER 6

QUALITY ASSURANCE DESIGN AND RESOURCES AND ADVERSE OUTCOMES

As Chapter 5 discussed the relationship between hospital characteristics and QA design and resources, this chapter will analyze how the adequacy of QA design and resources affects adverse outcomes. LISREL analysis is used to examine the goodness of fit of the proposed model (Figure 7).

Measurement Model of the Adequacy of Quality Assurance Design and Resources

The LISREL measurement model specifies the relationships between unobserved theoretical constructs and observed variables (predictors). The measurement model of the adequacy of QA programs describes how well the observed indicators of the latent construct of QA adequacy reflect the structure and function of the QA program.

The proposed measurement model as presented in Figure 7 is revised based upon the results of the factor analysis, in conjunction with theory. The measurement model reflects the belief that the constructs of the adequacy of personnel qualifications (QUALPERS), the adequacy of the quantity of

personnel (QUANTPER), the extent of QA personnel's work autonomy (AUTONOMY), the extent of formalization of QA (ORGSTRUC), and the extent QA interacts with hospital-wide QA activities (COORD) influence perceived organizational commitment to QA functioning (COMMIT). For this reason, two models are necessary. The first is a measurement model of the adequacy of QA design and resources (Figure 11) and the second a structural model to relate those QA constructs to COMMIT.

The indicators PLICENSE, PROPT, and QASPREAD were set at one because they are considered to be the best indicators of the underlying concept they measure. The remaining indicators are estimated. The size of the lambdas (λ) indicate the influence of the unobserved concept on the observed indicator. Where the indicators are found to be statistically not significant, they are usually eliminated from the model.

The measurement model shows the relationship of the constructs to their respective indicators. It also demonstrates the intercorrelations among the underlying constructs.

As can be seen by Table 6, the initial model for QA design and resources was overfitted (x2/df<1). Revisions were made in an attempt to achieve a model which was logical, parsimonious, and well fitted ($1<x^2<2$). Table 7 shows the final model. The model shows that the

Figure 11. Final measurement model of the adequacy of quality assurance design and resources.

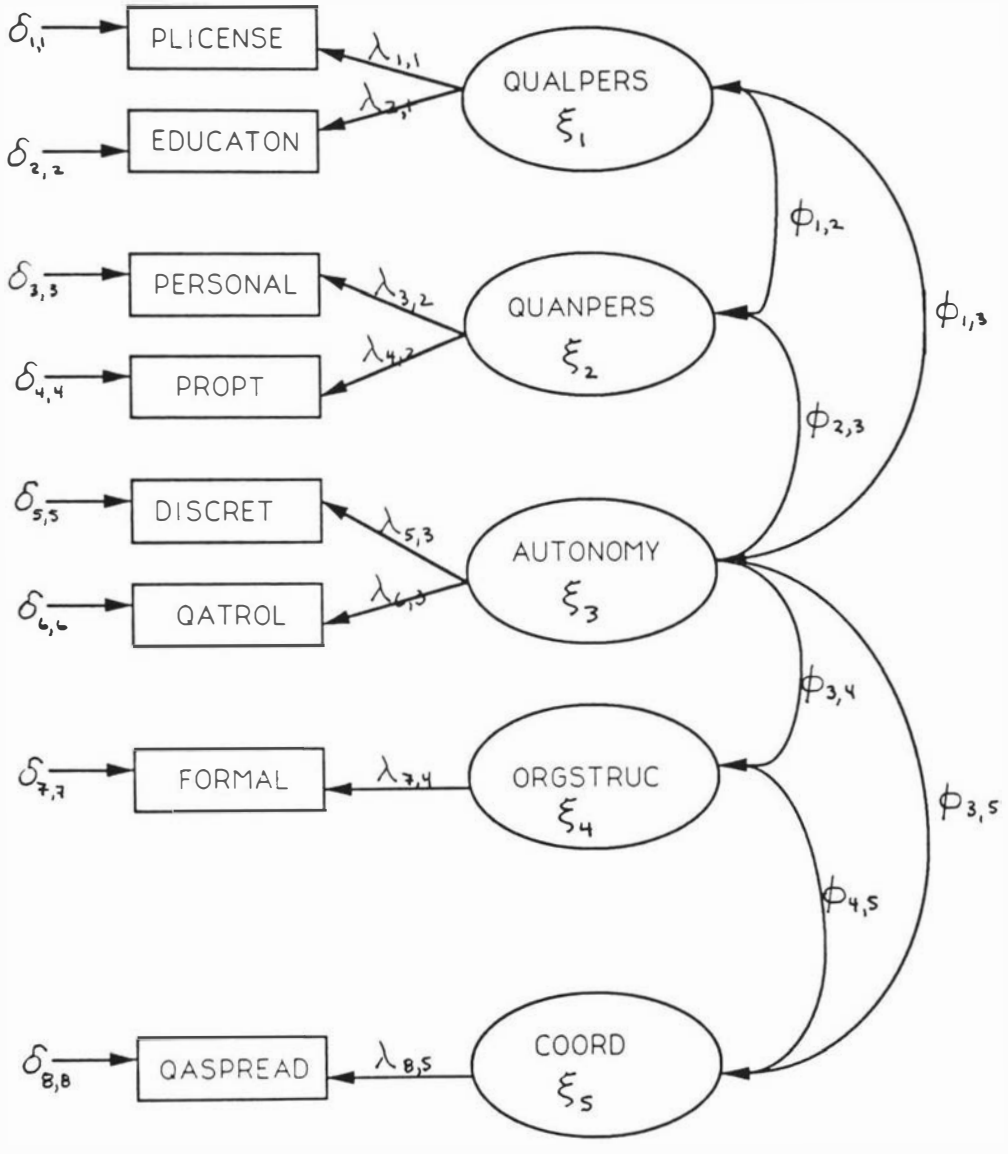


TABLE 6 Initial Measurement Model of Adequacy of Quality Assurance Design and Resources.

Parameters		Indicator		Construct	t-Value
LAMBDA (Factor Loadings)					
1,1	1.000	PLICENSE		QUALPERS	-
2,1	0.873	EDUCATON		QUALPERS	10.738*
2,2	-0.192	EDUCATON		QUANTPER	-2.361*
3,2	0.789	PERSONAL		QUANTPER	12.674*
4,2	0.921	PROPT		QUANTPER	-
5,3	0.809	DISCRET		AUTONOMY	7.537*
6,3	0.947	QATROL		AUTONOMY	9.277*
7,4	0.999	FORMAL		ORGSTRUC	11.894*
8,5	1.000	QASPREAD		COORD	-
INTERCORRELATIONS BETWEEN CONSTRUCTS (ϕ)					
1,2	0.420	QUALPERS	and	QUANTPER	4.814*
1,3	0.173	QUALPERS	and	AUTONOMY	1.834*
1,4	-0.041	QUALPERS	and	ORGSTRUC	-
1,5	0.043	QUALPERS	and	COORD	-
2,3	0.186	QUANTPER	and	AUTONOMY	1.960*
2,4	0.174	QUANTPER	and	ORGSTRUC	-
2,5	-0.042	QUANTPER	and	COORD	-
3,4	0.633	AUTONOMY	and	ORGSTRUC	7.946*
3,5	0.269	AUTONOMY	and	COORD	2.373*
4,5	0.134	ORGSTRUC	and	COORD	1.181
Measurement Error of the Indicators (δ)					
1,1	-	PLICENSE			-
2,2	0.375	EDUCATON			5.874*
3,3	0.267	PERSONAL			5.874*
4,4	-	PROPT			-
5,5	0.350	DISCRET			3.791*
6,6	0.109	QATROL			1.110
7,7	-	FORMAL			-
8,8	-	QASPREAD			-

Notes:
Chi-Square with 20df = 19.65
Chi-Square / df ratio = 0.9825
Goodness of Fit Index = 0.936
Adjusted Goodness of Fit Index = 0.856
* : p at 0.05 level for a one tailed t-test (1.725)
- : not estimated

TABLE 7 Final Measurement Model of Adequacy of Quality Assurance Design and Resources Parameters

		Indicator	Construct	T-values
Lambda (factor Loadings)				
1,1	1.000	PLICENSE	QUALPERS	-
2,1	0.780	EDUCATON	QUALPERS	10.112*
3,2	0.789	PERSONAL	QUANTPER	12.674*
4,2	0.921	PROPT	QUANTPER	-
5,3	0.809	DISCRETN	AUTONOMY	7.537*
6,3	0.947	QATROL	AUTONOMY	9.277*
7,4	0.999	FORMAL	ORGSTRUC	11.894*
8,5	1.000	QASPREAD	COORD	-
Intercorrelations between Constructs (ϕ)				
1,2	0.420	QUALPERS	& QUANTPER	4.814*
1,3	0.173	QUALPERS	& AUTONOMY	1.834*
2,3	0.186	QUANTPER	& AUTONOMY	1.960*
3,4	0.633	AUTONOMY	& ORGSTRUC	7.946*
3,5	0.269	AUTONOMY	& COORD	2.373*
4,5	0.134	ORGSTRUC	& COORD	1.181
Measurement error of the indicators (δ)				
1,1	-	PLICENSE		-
2,2	0.410	EDUCATON		5.874*
3,3	0.267	PERSONAL		5.874*
4,4	-	PROPT		-
5,5	0.350	DISCRETN		3.790*
6,6	0.109	QATROL		1.110
7,7	-	FORMAL		-
8,8	-	QASPPREAD		-

Notes:

Chi-Square with 21 df = 25.80
Chi-Square / df ratio = 1.229
Goodness of Fit Index = 0.918
Adjusted Goodness of Fit Index = 0.803
* : p at 0.05 level for a one tailed t-test (1.721)
- : not estimated

predictors PLICENSE (λ =1.000) and EDUCATON (λ =0.780) load strongly on the construct QUALPERS. PERSONAL (λ = 0.789) and PROPT (λ =0.921) load heavily on the construct QUANTPER, while DISCRETN (λ =0.809) and QATROL (λ=0.947) load heavily on the construct AUTONOMY. The predictor QASPREAD, as the single indicator for the construct COORD was set at λ=1.000. All of these indicators are very strongly related to the constructs and have therefore been retained.

The intercorrelations between constructs show that QUALPERS is significantly and positively correlated with QUANTPER and AUTONOMY. QUANTPER is significantly and positively correlated with AUTONOMY, as well as, QUALPERS. AUTONOMY is intercorrelated significantly and positively with all other constructs. ORGSTRUC is only positively correlated with AUTONOMY and COORD, although the intercorrelation is not statistically significant with coordination. COORD is positively correlated with AUTONOMY and ORGSTRUC. The intercorrelation with ORGSTRUC is not statistically significant but is retained due to its contribution to the model's fit.

Structural Model

Perceived commitment to the quality assurance program (COMMIT) is conceived as an intermediate outcome. A structural equation model with COMMIT as the dependent variable is depicted in Figure 12 and Table 8

Figure 12. Final structural model of the relationship between adequacy of quality assurance design and resources and organizational commitment.

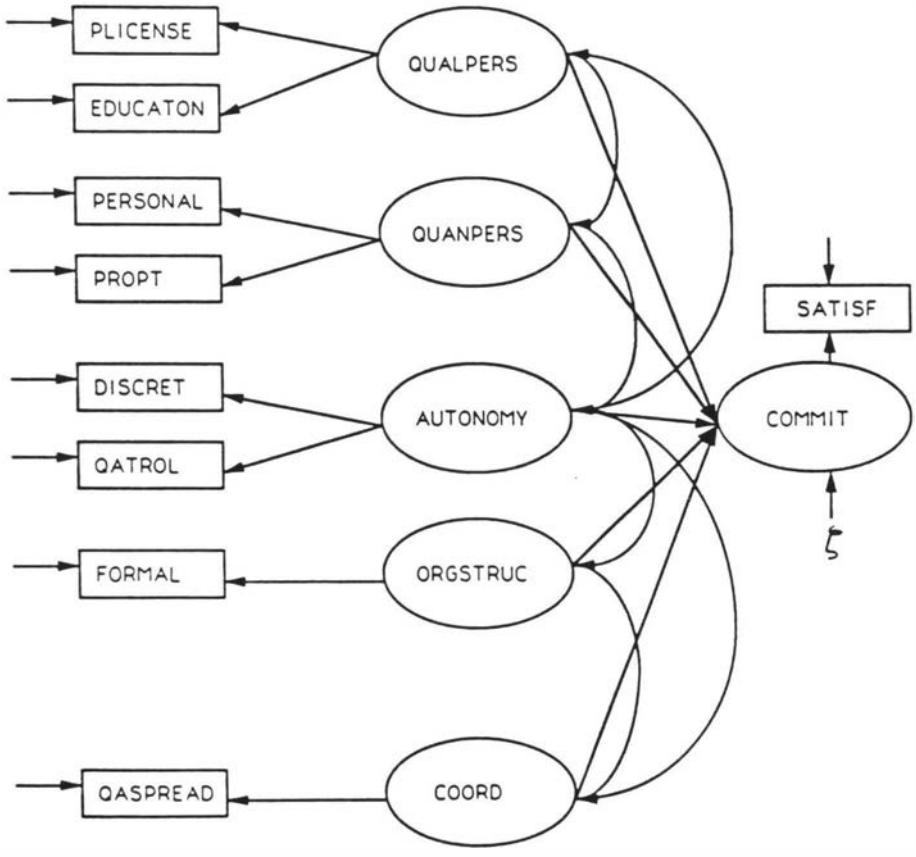


TABLE 8 Structural Equation Model of the Relationships Among the Adequacy of Quality Assurance Design and Resources and Perceived COMMITMENT to Quality Assurance

Parameters		Indicator	Construct
Lambda (Factor Loadings)			
Lambda Y			
1,1	1.000	SATISF	COMMIT
Lambda X			
1,1	1.000	PLICENSE	QUALPERS
2,1	0.860	EDUCATON	QUALPERS
2,2	-0.208	EDUCATON	QUANTPER
3,2	0.856	PERSONAL	QUANTPER
4,2	1.00	PROPT	QUANTPER
5,3	0.811	DISCRET	AUTONOMY
6,3	0.948	QATROL	AUTONOMY
7,4	1.000	FORMAL	ORGSTRUC
8,5	1.000	QASPREAD	COORD
Effect of the constructs on Commitment Y (γ)			
1,1	-0.179		QUALPERS
1,2	0.100		QUANTPER
1,3	0.031		AUTONOMY
1,4	0.454		ORGSTRUC
1,5	-0.129		COORD
Intercorrelation between constructs (Φ)			
1,2	0.440		QUALPERS & QUANTPER
1,3	0.188		QUALPERS & AUTONOMY
2,3	0.090		QUANTPER & AUTONOMY
3,4	0.638		AUTONOMY & ORGSTRUC
3,5	0.257		AUTONOMY & COORD
4,5	0.129		ORGSTRUC & COORD

TABLE 8 (continued)

Measurement error of indicators (δ)

1,1	-	PLICENSE
2,2	0.375	EDUCATON
3,3	0.267	PERSONAL
4,4	-	PROPT
5,5	0.349	DISCRET
6,6	0.110	QATROL
7,7	-	FORMAL
8,8	-	QASPREAD

Measurement error of indicator (E)

1,1	0.388	COMMIT

Notes:

Chi-Square with 21 df = 26.61
Chi-Square / df ratio = 1.267
Goodness of Fit Index = 0.924
Adjusted Goodness of Fit Index = 0.857
R-square
- : not estimated
t-values are not generated because ULS was used to analyze the data.

contains the results. As single measures of a construct, SATISF, FORMAL, PROPT and QASPREAD were all considered perfect measures and, therefore, set as $\lambda = 1.000$. All indicatorsload strongly on their associated constructs with a positive direction. EDUCATON loads on its associated construct QUALPERS, but it is also negatively related to QUANTPER. This would indicate that as the number of personnel in quality assurance increases their educational preparation decreases. It should be noted that this relationship between EDUCATON and QUANTPER was removed from the measurement model but replaced in the structural model. This relationship is weak but adds to the fit of the structural model as well as being logical. It is therefore retained.

The effects of the constructs on commitment load less heavily than expected with the exception of organizational structure. QUALPERS and COORD both are negative which indicates that as both increase organizational commitment is perceived to decrease. The other constructs are positive which indicates that perceived organizational commitment increases as the quantity of QA personnel, their autonomy, and the extent of formalization of QA increases. The proposed model has a good fit with a X^2/df ratio of 1.267 and an adjusted goodness of fit (AGOF) index of 0.857.

The final structural equation model explores the causal relationships of the adequacy of quality assurance design

and resources to adverse outcomes of hospitalization. But first, the relationships among the indicators of adverse outcomes and the construct must be established.

Models of Adverse Outcomes of Hospitalization

Based upon factor analysis of the PRO outcome data, adverse outcomes are initially conceptualized as having three constructs-process related outcomes, iatrogenic injuries, and death. Evaluation of the results of the initial model (Table 9) suggested that there are two levels of outcomes rather than three different outcomes. The final structural equation model as seen in Figure 13 reflects an intermediate outcome related to the process of caregiving and the patient's response to it and an endproduct of unexpected death.

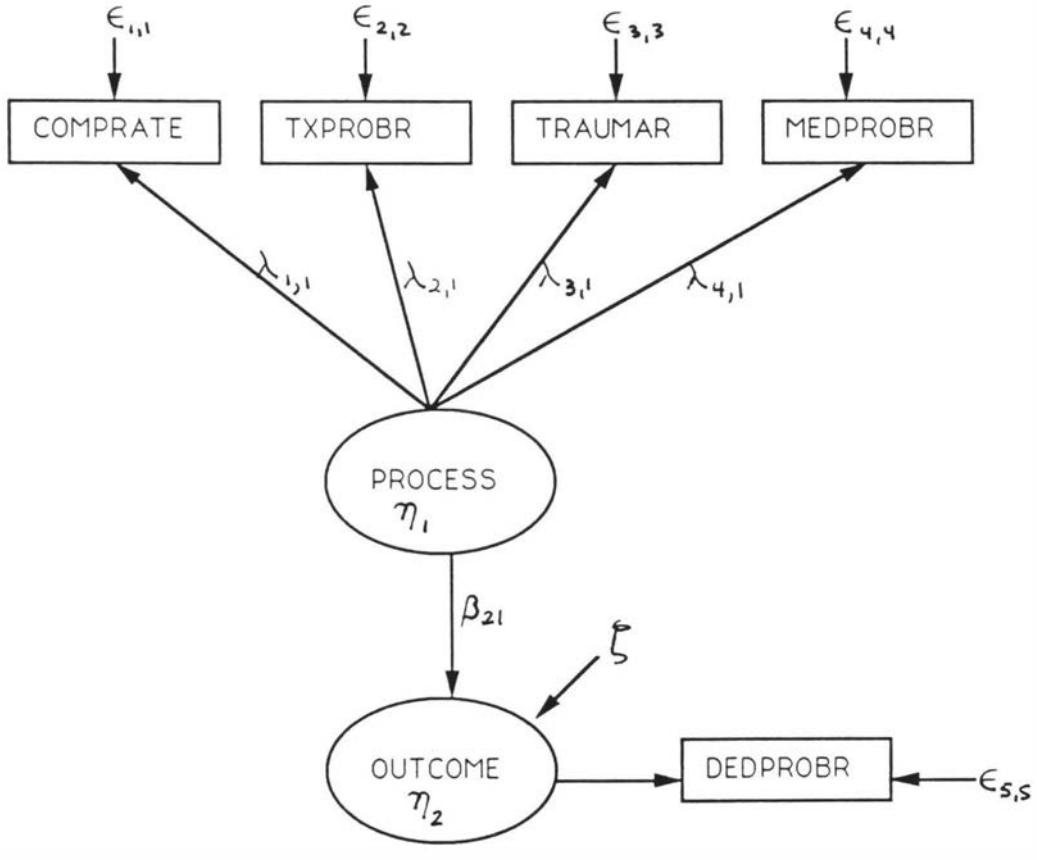
Several changes in the specification were made. NOSORATE was eliminated because it was not statistically significant. This was not surprising since nosocomial infection rates are questionable due to significant underreporting. PRORATE was eliminated because it applied to only three (3) hospitals in 1987. COSTRATE and DAYRATE were dropped because they were undesired outcomes for the organization rather than the individual. MORTRATE was eliminated because it encompassed not only preventable death but also unpreventable death. It was decided that QA programs can not affect unpreventable deaths, therefore,

TABLE 9 Initial Measurement Model for Adverse Outcomes of Hospitalization

Parameters		Indicator	Construct	T-value
Lambda (Factor Loadings)				
1,1	0.968	COMPRATE	PROCESS	-
1,2	0.817	TXPROBR	PROCESS	12.654*
1,3	0.763	DEDPROBR	PROCESS	10.292*
3,7	1.000	MORTRATE	OUTCOME	-
2,4	0.375	NOSORATE	IATROGEN	3.429*
2,5	0.897	TRAUMAR	IATROGEN	-
2,6	0.353	MEDPROBR	IATROGEN	3.446*
1,6	0.304	MEDPROBR	PROCESS	2.967*
Intercorrelation between constructs (Φ)				
1,2	0.252	IATROGEN	PROCESS	2.314*
1,3	-0.069	OUTCOME	PROCESS	-
2,3	-0.113	OUTCOME	IATROGEN	-
Measurement error of the indicators (δ)				
2,2	0.288	TXPROBR		5.874*
3,3	0.379	DEDPROBR		5.874*
4,4	0.825	NOSORATE		5.874*
6,6	0.677	MEDPROBR		5.874*

Notes:
Chi-square with 18 df = 10.38
Chi-square / df ratio = 0.577
Goodness of fit index = 0.958
Adjusted Goodness of fit index = 0.883
* : p at 0.05 level for a one tailed t-test (1.734)

Figure 13. Causal model of adverse outcomes of hospitalization.



they should not be included. The indicator DEDPROBR isolated preventable deaths. DEDPROBR became the sole measure of the final outcome of care based on theoretical considerations. Table 10 presents the results of the final structural equation model for adverse outcomes of hospitalization.

Although the structural equation model is somewhat "overfitted", it is a logical, and parsimonious one. The process-outcome linkage is highly significant and in the expected direction. The predictors for PROCESS are all statistically significant and in the anticipated direction. The single predictor for outcome - DEDPROBR -is considered a perfect measure. The final structural model will causally test the impact of the adequacy of QA design and resources on adverse outcomes of hospitalization.

QA Design and Resources and Adverse Outcomes of Hospitalization

Structural Equation Model. This structural equation model causally links QA program design and resources to adverse outcomes of hospitalization. Two models were formulated for model fitting. The first model hypothesized (Figure 14) that the adequacy of QA design and resources affected perceived organizational commitment to QA (COMMIT) which then directly affected intermediate process - related outcomes (PROCESS). Table 11 presents the results of direct linkage of the intermediate process - related outcomes

TABLE 10 Structural Equation Model of Adverse Outcomes of Hospitalization

Parameters	Indicator	Construct		t-values
Lambda (Factor Loadings)				
Lambda Y				
1,1	1.000	DEDPROBR	OUTCOME	0.000
Lambda X				
1,1	0.935	COMPRATE	PROCESS	7.750*
2,1	0.862	TXPROBR	PROCESS	6.959*
3,1	0.323	TRAUMAR	PROCESS	2.618*
4,1	0.446	MEDPROBR	PROCESS	3.696*
Effect of the constructs on outcome Y (β)				
1,1	0.843		PROCESS	7.011*
Intercorrelation between constructs (Φ)				
1,1	1.00	PROCESS	PROCESS	0.000
Measurement error of indicators (δ)				
1,1	0.126	COMPRATE		0.832
1,2	0.038	TXPROBR and	COMPRATE	0.272
2,2	0.257	TXPROBR		1.798*
3,3	0.896	TRAUMAR		5.799*
3,4	0.338	TRAUMAR and	MEDROBR	2.997*
4,4	0.801	MEDPROBR		5.691*
Measurement error of indicator (ϵ)				
1,1	0.000	DEDPROBR		0.000
Error term of dependent variable (ζ)				
1,1	0.289	OUTCOME		2.223*

Notes:

Chi-square with 3 df = 2.16
Chi-square/df ratio = 0.72
Goodness of Fit Index = 0.988
Adjusted Goodness of Fit Index = 0.985
R-square = 0.892
-: not estimated
* : p at 0.05 level for a one tailed t-test (1.645)

Figure 14. First conceptualization of the structural equation model for the relationship between the adequacy of quality assurance design and resources and adverse outcomes of hospitalization.

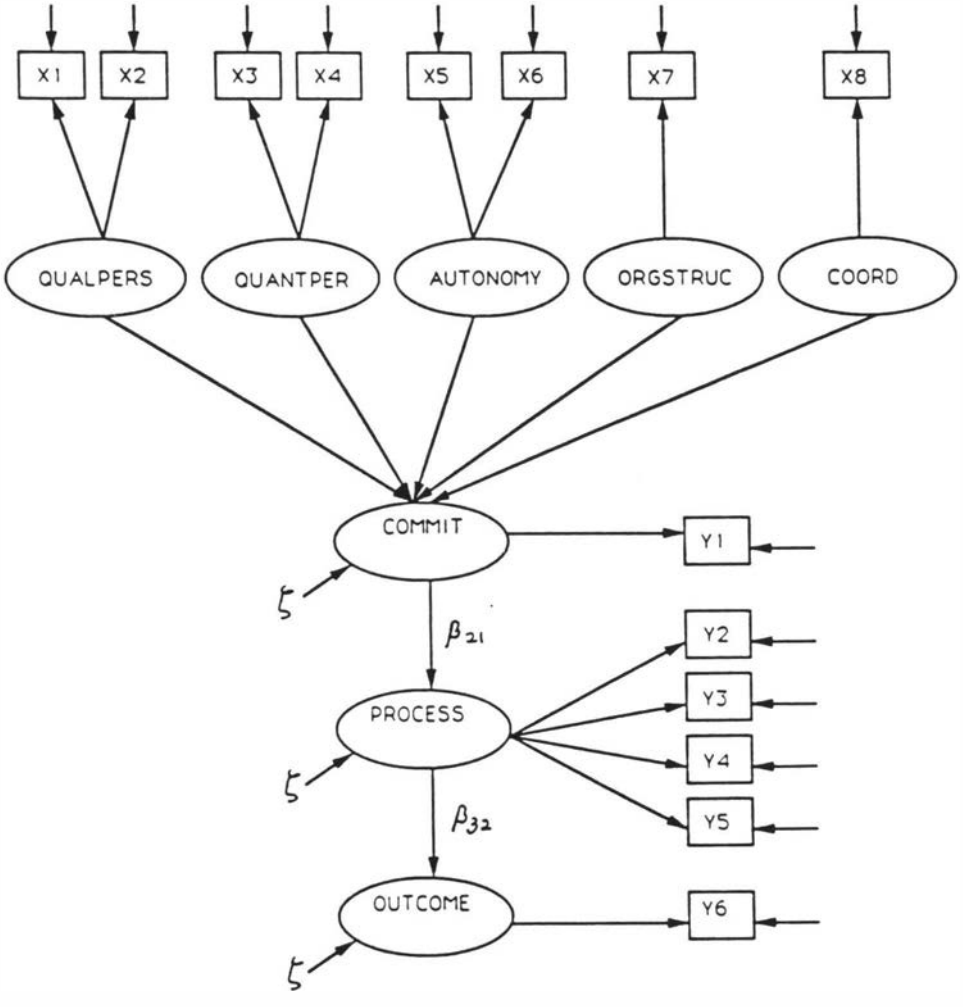


TABLE 11 First Conceptualization of the Relationships Among the Adequacy of Quality Assurance Design and Resources and Adverse Outcomes of Hospitalization

Parameters		Indicator		Construct
Lambda (Factor Loadings)				
Lambda Y				
1,1	0.900	SATISF		COMMIT
2,2	0.929	COMPRATE		PROCESS
3,2	0.866	TXPROBR		PROCESS
4,2	0.326	TRAUMAR		PROCESS
5,2	0.438	MEDPROBR		PROCESS
6,3	1.000	DEDPROBR		OUTCOME
Lambda X				
1,1	1.000	PLICENSE		QUALPERS
2,1	0.767	EDUCATON		QUALPERS
3,2	0.856	PERSONAL		QUANTPER
4,2	1.000	PROPT		QUANTPER
5,3	0.813	DISCRET		AUTONOMY
6,3	0.953	QATROL		AUTONOMY
7,4	1.000	FORMAL		ORGSTRUC
8,5	1.000	QASPREAD		COORD
Effect of Exogenous constructs on endogenous constructs (γ)				
1,1	-0.214	QUALPERS	&	COMMIT
2,1	0.133	QUALPERS	&	COMMIT
3,1	0.019	AUTONOMY	&	COMMIT
4,1	0.513	ORGSTRUC	&	COMMIT
5,1	-0.147	COORD	&	COMMIT
Intercorrelation between constructs (Φ)				
1,2	0.449	QUALPERS	&	QUANTPER
1,3	0.187	QUALPERS	&	AUTONOMY
2,3	0.211	QUANTPER	&	AUTONOMY
2,4	0.195	QUANTPER	&	ORGSTRUC
3,4	0.653	AUTONOMY	&	ORGSTRUC
3,5	0.271	AUTONOMY	&	COORD
4,5	0.150	ORGSTRUC	&	COORD
Effect of endogenous contructs on endogenous constructs (β)				
2,1	.169	PROCESS		COMMIT
3,2	.810	OUTCOME		PROCESS

(TABLE 11 continued)

Measurement error of indicators (δ)

1,1	-	PLICENSE
2,2	0.412	EDUCATON
3,3	0.267	PERSONAL
4,4	-	PROPT
5,5	0.351	DISCRET
6,6	0.108	QATROL
7,7	-	FORMAL
8,8	-	QASPREAD

Measurement error of indicators (ϵ)

1,1	0.626	SATISF
2,2	0.097	COMPRATE
3,3	0.215	TXPROBR
4,4	0.889	TRAUMAR
5,5	0.800	MEDPROBR
6,6	-	DEDPROBR

Intercorrelation among endogenous construct's error terms (ψ)

COMMIT	0.105
PROCESS	1.000
OUTCOME	0.314

Notes:

Chi-square with 69 df = 88.64
Chi-square / df ratio = 1.285
Goodness of Fit Index = 0.860
Adjusted Goodness of Fit Index = 0.591
- = not estimated
t-values are not generated because ULS was used to analyze the data.

to the final outcome. The second model is expanded to include the causal links identified by the first model plus causal links going from all QA design and resource constructs to the intermediate process-related outcomes (Figure 15). Although both models are reasonable, the data proved to fit the second model better (Table 12). Table 13 presents a comparison of the goodness of fit statistics of the two models.

The structural equation model retained shows causal linkages from the five QA design and resources constructs to perceived organizational commitment and to process-related outcomes. Interestingly, the strongest predictor, QA structure, is a measure of QA program formalization. The positive signs indicate that as formalization in the QA program increases the QA personnel perceive an increased commitment by the organization to the QA program, and the rate of process-related outcomes increases. AUTONOMY, which is closely associated with formalization, is very weakly linked to COMMIT and negatively and somewhat more strongly linked to PROCESS. Although the direction of the relationship with COMMIT is as expected, the lack of strength in AUTONOMY is unexpected. The negative relationship of AUTONOMY and PROCESS is also expected. It indicates that increased autonomy for the QA program results in a decreased rate of process-related outcomes. This finding, in conjunction with the positive relationship

Figure 15. Second conceptualization of the structural equation model and final model of the adequacy of quality assurance design and resources and adverse outcomes of hospitalization.

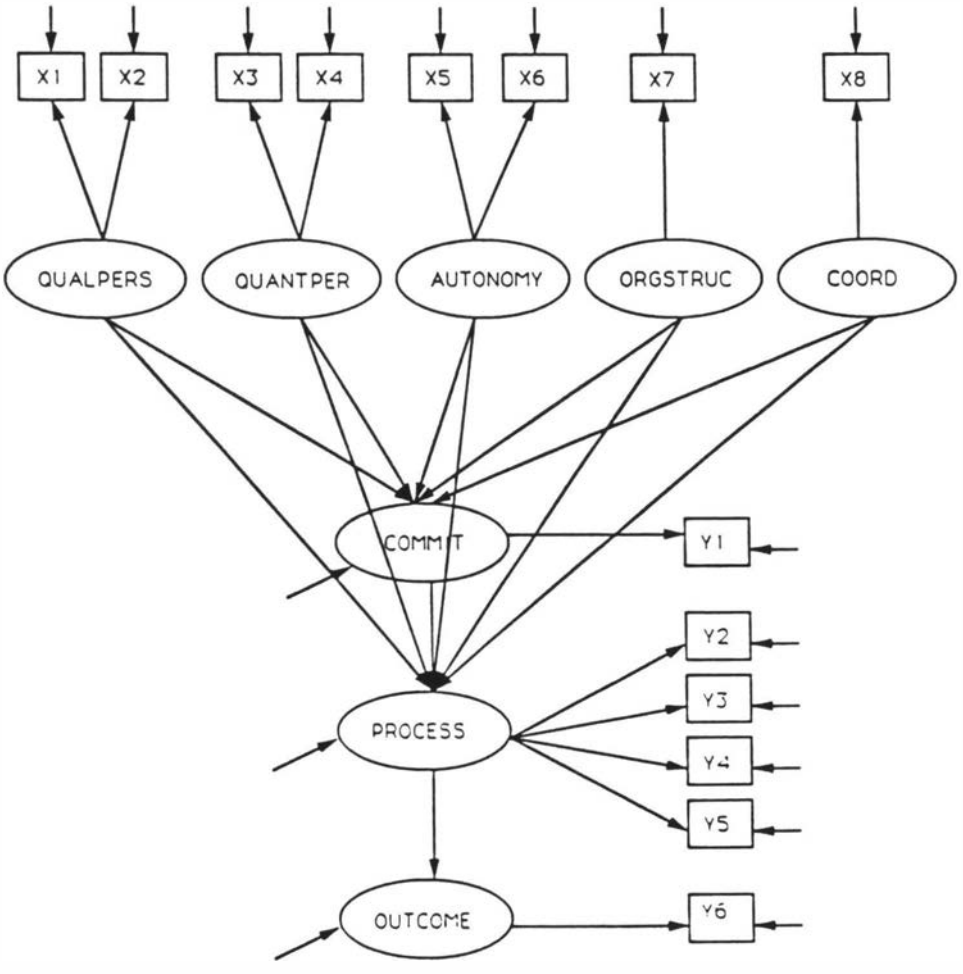


TABLE 12 Second Conceptualization of the Structural Equation Model and Final Model of QA Design and Resources and Adverse Outcomes of Hospitalization

Parameters	Indicator	Construct
Lambda (factor loadings)		
Lambda Y		
1,1 0.984	SATISF	COMMIT
2,2 0.925	COMPRATE	PROCESS
3,2 0.869	TXPROBR	PROCESS
4,2 0.331	TRAUMAR	PROCESS
5,2 0.438	MEDPROBR	PROCESS
6,3 1.000	DEDPROBR	OUTCOME
Lambda x		
1,1 1.000	PLICENSE	QUALPERS
2,1 0.767	EDUCATON	QUALPERS
3,2 0.856	PERSONAL	QUANTPERS
4,2 1.000	PROPT	QUANTPERS
5,3 0.819	DISCRET	AUTONOMY
6,3 0.947	QATROL	AUTONOMY
7,4 1.000	FORMAL	ORGSTRUC
8,5 1.000	QASPREAD	COORD
Intercorrelation between constructs (β)		
1,1 -0.278	COMMIT	PROCESS
2,2 0.812	PROCESS	OUTCOME
Effect of exogenous constructs on endogenous constructs (γ)		
1,1 -0.190	QUALRES	COMMIT
2,1 -0.147	QUALRES	PROCESS
1,2 0.108	QUANRES	COMMIT
2,2 0.192	QUANRES	PROCESS
1,3 0.033	AUTONOMY	COMMIT
2,3 -0.180	AUTONOMY	PROCESS
1,4 0.464	ORGSTRUC	COMMIT
2,4 0.316	ORGSTRUC	PROCESS
1,5 -0.137	COORD	COMMIT
2,5 -0.033	COORD	PROCESS

(TABLE 12 continued)

Intercorrelation between constructs (ϕ)

2,1	0.449	QUANTPER	QUALPERS
3.1	0.184	AUTONOMY	QUALPERS
3,2	0.213	AUTONOMY	QUANTPER
4,2	0.195	ORGSTRUC	QUANTPER
4,3	0.657	ORGSTRUC	AUTONOMY
5,3	0.271	COORD	AUTONOMY
5,4	0.150	COORD	ORGSTRUC

Measurement error of Y indicators (ϵ)

1,1	0.366	SATISF
2,2	0.106	COMPRATE
3,3	0.210	TXPROBR
4,4	0.885	TRAUMAR
5,5	0.799	MEDPROBR

Measurement error of X indicators (δ)

2,2	0.412	EDUCATON
3,3	0.267	PERSONAL
5,5	0.121	QATROL

Note:

Chi-square with 64 df = 85.54
Chi-square / df ratio = 1.337
Goodness of Fit index = 0.864
Adjusted Goodness of fit index = 0.653
R-square = 0.478

TABLE 13 A Comparison of the Two Proposed Structural Equation Models for QA Design and Resources and Adverse Outcomes of Hospitalization

Model	X^2	df	X^2/df	AGOF	R^2
1	88.64	69	1.285	.591	.763
2	85.54	64	1.337	.653	.478

$$X^2_{(df1-df2)} = \frac{X^2_1 - X^2_2}{df_1 - df_2} = \frac{3.1}{5} = .62$$

* : p at 0.05 level for a one-tailed t-test (2.015)
(There were no statistically significant values.)

between ORGSTRUC and PROCESS, indicate that increased flexibility for the QA personnel results in improved intermediate outcome. The negative and somewhat weak contributions of QUALPERS and COORD to COMMIT offer interesting insights into how personnel qualifications and the scope of work demands might affect how the QA professional perceives the organization's support for their work. The negative relationships suggest that as the qualifications of Outcomes of Hospitalizationthe professional staff increase, their expectations of how the organization should support QA work may become more stringent that results in a perception of less support when they are not met. The weak but negative relationship between COORD and COMMIT suggests that an increasing scope of QA functioning can result in a decrease in the perception that the organization is committed to QA work. This might relate to the QA personnel's feeling that there are too few resources available to do their work. Inspection of the mean scores (2.56 out of a possible score of 5) of the QA personnel's satisfaction with financial and personnel resources reveal that they are moderately satisfied with the resources provided them to do their work. The construct QUANTPER is very weakly related but does indicate that increased personnel resources contribute to an increase in the perceived commitment of the organization to QA work.

The very weak negative relationships of QUALPERS and

COORD to PROCESS suggest that the influence of both constructs serves to decrease the rate of process related adverse outcomes. The weakness of these linkages and the inability to obtain t-values to statistically test the significance of these gammas allow that the findings only be interpreted as linkages needing further study even though they appear to be theoretically reasonable.

QUANTPER affects both COMMIT and PROCESS very weakly. This may reflect the lack of variance among QA programs in the study hospitals.

The adequacy of QA design and resources influences the QA personnel's perceived commitment of the hospital to QA functioning. This perception will also affect the functioning of the QA program in detecting adverse process-related outcomes. Although the linkage is only moderately strong, it indicates that perceived organizational commitment can help decrease the rate of process-related adverse outcomes.

This causal relationship supports Deming and the proponents of his method of management. The moderate linkage suggests that additional factors enter into the rate of process-related adverse outcomes and the functioning of the QA program. The strong linkage (β=0.764) between process-related adverse outcomes and the final outcome of an unexpected death point to the importance of detecting process-related adverse outcomes before they progress to

death. Again, this affirms Deming that quality assurance must be pervasive through the organization to prevent problems that may be related to quality, or, if present, detected and corrected before the occurrence an unacceptable outcome.

When hospital size and specialization are controlled as seen in Figure 16, changes are noted (Table 14). The R^2 increases from .478 to .616; the Chi-square/df ratio increases from 1.337 to 1.81 and the AGOF index declines from .653 to .448. This is not unexpected, because the measure of specialization, BRDCERT, is known to statistically affect the outcome measure.

The LISREL analyses of the data suggest that the data only moderately fit the model, but that the model, as presented, accounts for 76.3% of the variation in unexpected deaths. By using the outcome measures DEDPROBR (unexpected deaths), and the process-related measures of COMPRATE, TXPROBR, TRAUMAR, and MEDPROBR the model illustrates that more sensitive outcome measures can be affected by quality assurance activities. This contrasts to the use of mortality rate alone in which the magnitude of deaths unrelated to quality of care issues, obscures those amenable to QA activities, thus, not allowing the effect of QA programs to be seen and studied. This research has provided empirical evidence that can causally link the adequacy of QA design and resources to the rates of intermediate and final

Figure 16. Structural equation model of the relationship of the adequacy of quality assurance design and resources and adverse outcomes of hospitalization with controls.

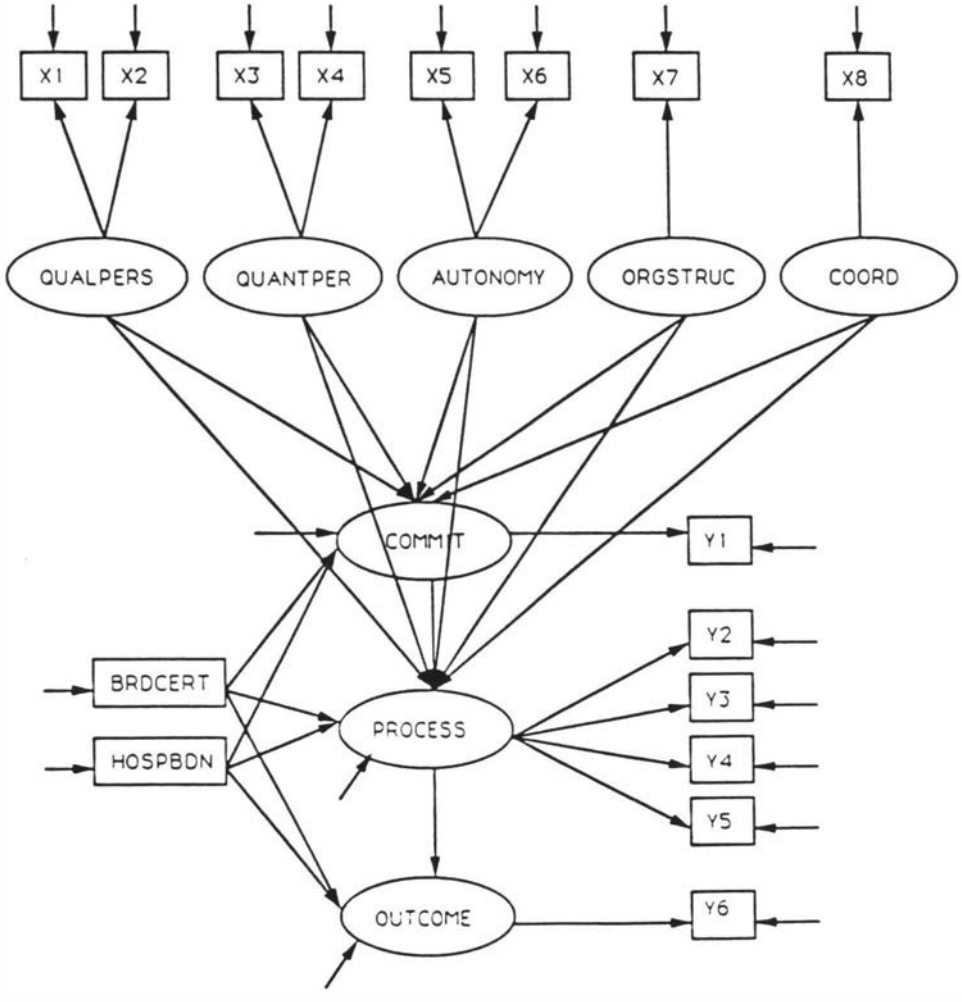


TABLE 14 Structural Equation Model of the Adequacy of QA Design and Resources with Control Variables

Parameter		Indicator	Construct
Lambda (Factor Loading)			
	LAMBDA Y		
1,1	0.945	SATISF	COMMIT
2,2	0.925	COMPRATE	PROCESS
3,2	0.789	TXPROBR	PROCESS
4,2	0.292	TRAUMAR	PROCESS
5,2	0.398	MEDPROBR	PROCESS
6,3	1.000	DEDPROBR	OUTCOME
	LAMBDA X		
1,1	1.000	PLICENSE	QUALRES
2,1	0.767	EDUCATON	QUALRES
3,2	0.856	PERSONAL	QUANRES
4,2	1.000	PROPT	QUANRES
5,3	8.815	DISCRET	AUTONOMY
6,3	0.951	QATROL	AUTONOMY
7,4	1.000	FORMAL	ORGSTRUC
8,5	1.000	QASPREAD	COORD
9,6	1.000	HOSPBDN	SIZE
10,7	1.000	BRDCERT	SPECIALIZATION
Effect of the constructs on Y (β)			
2,1	-0.347	COMMIT	PROCESS
3,2	0.759	PROCESS	OUTCOME
Interrcorrelation between endogenous and exogenous constructs (γ)			
1,1	-0.003	QUALRES	COMMIT
2,1	-0.021	QUALRES	PROCESS
1,2	0.097	QUANRES	COMMIT
2,2	0.005	QUANRES	PROCESS
1,3	0.087	AUTONOMY	COMMIT
2,3	-0.099	AUTONOMY	PROCESS
1,4	0.414	ORGSTRUC	COMMIT
2,4	0.284	ORGSTRUC	PROCESS
1,5	-0.145	COORD	COMMIT
2,5	-0.015	COORD	PROCESS
1,6	-0.385	SIZE	COMMIT
2,6	-0.049	SIZE	PROCESS
3,6	-0.098	SIZE	OUTCOME
1,7	-0.038	SPECIAL	COMMIT
2,7	-0.490	SPECIAL	PROCESS
3,7	0.081	SPECIAL	OUTCOME

(TABLE 14 continued)

Interrcorrelations between exogenous constructs (Φ)

6,1	1.000	QUALRES	QUALRES
2,1	0.449	QUANRES	QUALRES
3,1	0.187	AUTONOMY	QUALRES
2,2	1.000	QUANRES	QUANRES
3,2	0.212	AUTONOMY	QUANRES
4,2	0.195	ORGSTRUC	QUANRES
3,3	1.000	AUTONOMY	AUTONOMY
4,3	0.654	ORGSTRUC	AUTONOMY
5,3	0.271	COORD	AUTONOMY
4,4	1.000	ORGSTRU	ORGSTRUC
5,4	0.150	COORD	ORGSTRUC
5,5	1.000	COORD	COORD
6,6	1.000	SIZE	SIZE
7,6	0.354	SPECIAL	SIZE
7,7	1.000	SPECIAL	SPECIAL

Measurement error of indicators (ϵ)

1,1	0.285	SATISF
2,2	0.120	COMPRATE
3,3	0.220	TXPROBR
4,4	0.893	TRAUMAR
5,5	0.802	MEDPROBR

Measurement error of indicators (δ)

2,2	0.412	EDUCATON
3,3	0.829	PERSONAL
5,5	0.348	DISCRET
6,6	0.112	QATROL

Notes:

Chi square with 87df	= 157.33
Chi-square / df ratio	= 1.81
Goodness of fit index	= 0.801
Adjusted Goodness of fit index	= 0.448
R squared	= .616

adverse outcomes of hospitals.

Hypotheses

Chapter 4 contains hypotheses for testing the effect of adequacy of QA design and resources and adverse outcomes of hospitalization. In analyzing the data, the following results of hypothesis testing can be summarized.

Hypotheses 5 states that the more formalized the quality assurance mechanism, the fewer the adverse outcomes of hospitalization. The data provided mixed support for thishypothesis. The model demonstrates that increased formalization positively impacts QA personnel's perceptions of the organization's commitment to QA. This then results in a decreased rate of process-related adverse outcomes. More directly, increased formalization results in increased process-related outcomes. The linkage between ORGSTRUC and COMMIT is stronger, thus indicating that it is the dominant effect.

Hypothesis 6 states that the greater the perceived autonomy allowed quality assurance personnel in the performance of their work, the fewer the adverse outcomes of hospitalization. As with hypothesis 5, increased autonomy leads to increased perceived organizational commitment which results in a decreased rate of adverse outcomes. The weak causal linkage of AUTONOMY to COMMIT suggests that AUTONOMY does not exert a strong influence on the QA personnel's perceptions of organizational COMMIT to QA. More directly

and stronger is the linkage between AUTONOMY and PROCESS. This linkage indicates that increased autonomy results in a decreased rate of process-related outcomes.

Hypothesis 7 states that the greater the perceived organizational commitment to QA, the fewer adverse outcomes of hospitalization. This hypothesis is supported, although the causal link between COMMIT and PROCESS is not as strong as was anticipated. As previously discussed, this points out the complexity of factors influencing the rate of adverse outcomes of hospitalization.

Hypothesis 8 states that the more perceived control QA personnel have, the fewer adverse outcomes of hospitalization will be observed. This hypothesis is both directly and indirectly supported. QATROL is a strong predictor of AUTONOMY but AUTONOMY is weakly and negatively linked to COMMIT which is positively linked to PROCESS. Thus, as QATROL increases so does COMMIT, but due to the negative relationship between COMMIT and PROCESS, outcomes decrease, as does unexpected death (OUTCOME).

Summary

The analysis highlights a strong positive causal link between process-related outcomes and unexpected deaths. The adequacy of QA design and resources measured by the five latent variables account for 47.8% of the variation in unexpected death rates. The strength of the causal linkage between COMMIT and PROCESS highlights the complexity of

factors which lead to adverse outcomes of hospitalization.

Overall, the analyses of the data present a reasonable model of causal relationship. Above all, areas amenable to change by hospital management are identified and causal relationships presented. A parsimonious and effective model for measuring process-related adverse outcomes is presented. This offers managers and peer review organizations some new insights about an effective way to identify problems which lead to deaths. It also offers more refined outcomes.

CHAPTER 7

SUMMARY AND CONCLUSIONS

The purpose of this study is to explore the relationships among hospital quality assurance mechanisms, organizational context, and adverse outcomes of hospitalization. Analytical models were formulated and tested using descriptive, exploratory, and confirmatory statistics. The models were examined using primary quality assurance and outcome data of seventy acute care general hospitals in the Commonwealth of Virginia. Data were obtained from the hospitals and the Medical Society of Virginia Peer Review Organization, organizational level data from the American Hospital Association and the Federal Register; and area level data from the Virginia Statistical Abstract (1987). The outcome variables at the intermediate outcome level were the rate of unexpected returns to the operating room, the inhospital trauma rate, the rate of complications with a medication or treatment, and medical instability at discharge. The final outcome variable was unexpected death.

Regression was used to explore the impact on hospital

size and specialization on the design of and resources provided the QA program. Size positively influenced the number of registered nurses working in the QA program and the number of QA professionals with an academic degree above the associate level. This indicates that as size increases the qualifications of the hospital's QA professionals increase. Size and the ratio of full time QA equivalents to the total number of hospital FTEs (FTE), both total and professionals alone, are negatively related. This relationship indicates that increasing hospital size results in proportionately less personnel resources being allocated to the central quality assurance program. This probably reflects QA efforts becoming more decentralized with a decrease in the central program's personnel.

Hospital specialization was also inversely related to the QA-hospital FTEs ratio. This indicates that as the hospital's degree of specialization becomes greater, less personnel resources were allocated to the central quality assurance program. This was true for both total QA FTEs and for professional QA FTEs. As previously noted, this probably reflects decentralization of the QA program.

All of these findings are consistent with expectations arising from the contingency perspective. Of interest though, were the design characteristics of the QA program which are not affected by the hospital's size and specialization. Neither the extent of QA formalization nor

the degree of discretion allowed QA personnel in performing their work were statistically significant. The contingency perspective would hold that there would be an effect on the amount of program discretion with both size and specialization. This was not found to be true in this study. Likewise, it was found that the extent of the QA program's responsibilities within the hospital was not affected by either size or specialization. From the descriptive data, it is evident that the scope of QA functioning is rather narrow without much variance among the hospitals in this study. This again is not consistent with expectations of an increased need for coordination among the various aspects of the QA program as the hospital grows or becomes more differentiated.

LISREL was used to explore the causal relationships among selected design features of QA programs and QA resources and adverse outcomes of hospitalization. The accepted model supports Donabedian's basic input-process-outcome framework. It also affirms Deming's focus on the importance of organizational commitment to improved quality. Organizational structure, which is the strongest predictor of perceived organizational commitment, is positively related to commitment. Autonomy was weakly and positively linked to commitment. Organization structure also had the strongest causal linkage to the rate of process-related adverse outcomes of care, as opposed to autonomy that was

weakly and negatively linked. These relationships indicate that increasing structure placed on the QA program results in decreased autonomy, improved rate of process-related adverse outcomes, and greater perceived organizational commitment by QA personnel. The impact of the positive relationship between autonomy and commitment seems minor in relation to the effect of organizational structure.

The concepts of quality and quantity of QA personnel are opposite in sign but of approximately the same magnitude in their relationships to both perceived commitment and process-related outcomes. Quality of personnel resources is negatively related to both perceived commitment and the process outcomes. This indicates that as more registered nurses and QA professionals with education above the associate degree level are involved in QA, their perception of organizational commitment to QA decreases and the rate of process-related adverse outcomes decreases. The positive relationships of the quantity of QA personnel to both commitment and process outcomes indicate that increasing QA personnel increases perceived organizational commitment to QA but results in an increased rate of process-related adverse outcomes. This is an interesting finding, especially in light of the impact of coordination on both concepts. Coordination is negatively, although weakly, related to commitment. This may relate to QA personnel feeling they are pulled in many directions and responsible

to do more with fewer resources. The positive relationship of quantity of personnel to commitment indicates that as the number of persons available to do the work increases, their feelings of organizational commitment increases as does the rate of process-related adverse outcomes. One wonders if the increase in the rate of process-related outcomes is not related to more effective case finding rather than a decrease in quality. The negative but very weak relationship between coordination and process-related outcomes suggests that a hospital-wide, centralized quality assurance effort is advantageous. However, the weakness of this relationship is surprising and may be related to a lack of variance in the predictor.

The relationship between perceived organizational commitment by QA personnel and process-related outcomes is negative and moderate. This supports Deming's contentions that organizational commitment is critical to the success of QA. The moderate strength of the loading highlights the complexity of the process by which the rate of adverse outcomes is affected. Further study incorporating additional organizational and individual based predictors is necessary to understand this more fully.

The very strong positive relationships between process-related outcomes and the terminal outcome of unexpected death is expected and understandable. The finding of process-related adverse outcomes suggest strongly that

further deterioration in the patient's well-being is possible. It would be advantageous, therefore, to monitor the intermediate adverse outcomes as a means of preventing unexpected deaths rather than monitoring only the terminal outcome. From a QA perspective, this would be the logical approach.

The application of controls to the model caused minor changes. Regressions of numerous possible control variables demonstrated that only the percent of board-certified physicians on staff was statistically significant. No other measures of hospital specialization, size, hospital ownership, rurality, teaching status, or resource intensity (ALOS) were associated with the outcome variable at a statistically significant level.

Limitations of the Study

There are several limitations this study experienced. Of major concern was the limited sample size. Although seventy hospitals that comprise the vast majority of short term acute care general hospitals in the Commonwealth of Virginia are included in the study, the sample size forced the elimination of some variables of interest. This occurred because the number of estimates became too large for the sample size.

A second limitation was the lack of variance in many of the study variables. This homogeneity presented difficulties in causal modeling, as seen with the use of

unweighted least squares rather than maximum likelihood estimates. Greater variance would certainly contribute to more precise estimates.

The use of only short term acute care general hospitals in the Commonwealth of Virginia limits the generalizability of the results to only Virginia and the type of hospital studied.

Fourth, the study was a cross sectional one which did not allow for testing the stability of the model over time. One must also recognize that the primary data collected on QA program design and resources required the person answering the questionnaire to recall three year old data. A better approach would be to document QA design and resources and then collect outcome data over subsequent years.

Fifth, limiting the organizational variables to hospital size and specialization and those used in describing the QA program's design and resources neglects other structural and individual variables which most probably affect not only QA design and resources, but also adverse outcomes. Inclusion of additional variables would of course be limited by sample size.

And sixth, this research has focused exclusively on adverse outcomes of hospitalization. Positive or desired outcomes are not addressed. Subjective patient assessments of quality of care are not included. Exclusion of these

areas reflects the limited and well delineated areas of this study.

Future Directions for Study

Future study of quality assurance programs and their affect on adverse outcomes of hospitalization should be expanded to increase the sample size and diversity. Strategies should include multi-institutional studies done on a national basis. In addition, it should be expanded to study specialty hospitals as another group of providers. Application and, possible revision, of the model generated for short term, acute care general hospital's QA programs would open yet another area of inquiry.

As mentioned previously, a prospective research design following the outcome variables longitudinally would be an important step in further substantiating causation. Inclusion of additional organizational characteristics, including financial data, such as QA program budgets, and QA personnel salaries would open new areas of interest. More explicit micro-organizational level data, such as methods and frequency of QA data acquisition and methods of organization-wide coordination of QA monitoring and information feedback, would also offer additional understanding of how QA programs work.

This study has made several contributions to quality assurance research. It has linked the importance of quality

assurance program design and the resources allocated it to the rate of intermediate and terminal adverse outcomes of hospitalization. By identifying areas amenable to management, this study offers information which can be used in monitoring and influencing the rate of adverse outcomes of hospitalization. It has also identified several adverse outcomes, unexpected return to the OR, readmission within 15 days of discharge, treatment or medication problem, and medical instability at discharge, which can signal problems with quality of care.

This study has also offered a new methodological approach to this area of research by using LISREL. The use of multiple indicators in causal modeling permits the testing of a realistic representation of the causal relationships between the adequacy of QA design and resources and adverse outcomes. The availability of estimates of measurement error and model fit offer a realistic representation of how the model fits the data.

This study offers the research community a starting point for developing more sensitive measures of quality of care as opposed to the continued predominating use of the very blunt measure of mortality. The use of mortality as the predominate measure of quality of care in research seems to be dated and insensitive. QA research must utilize measures which can be used by practitioners in a reasonable and cost effective way. This research offers a starting point.

REFERENCES

REFERENCES

Anderson, G. F. & Steinberg, E. P. (1984). Hospital readmissions in the Medicare population. New England Journal of Medicine, 311(21), 1349-1353.

Becker, S. W., Shortell, S. M., & Neuhauser, D. (1980). Management practices and hospital length of stay. Inquiry, 17, 318-330.

Berwick, D. M., & Knapp, M. G. (1987). Theory and practice for measuring health care quality. Health Care Financing Review, (Annual Supplement 1987), 49-55.

Blau, P. M. (1970). A formal theory of differentiation in organizations. American Sociological Review, 35, 201-218.

Blau, P. M., & Schoenherr, R. (1971). The structure of organizations. New York: Basic Books.

Bliersbach, C. M. (1988). Quality assurance in health care: Current challenges and future directions. Quality Review Bulletin, (October), 315-319.

Brown, B. L. (1979). Risk management for hospitals. Germantown, MD: Aspen Systems Corporation.

Casemix 1986 Federal Register 52 (169) Sept. 1, 1987 Rules and Regulations, 33092.

Child, J. (1972). Organizational structure, environment and performance: The role of strategic choice. Sociology, 63(1), 2-22.

Child, J. (1973). Predicting and understanding organization structure. Administrative Science Quarterly, 18, 168-185.

Couch, N. P., Tilney, N. L., Rayner, A. A., & Moore, F. D. (1981). The high cost of low-frequency events. New England Journal of Medicine, 304(11), 634-637.

Daft, R. (1989). Organization theory and design (3rd Ed.). St. Paul: West Publishing Company.

Daft, R. (1983). Organization theory and design (1st Ed.). St. Paul: West Publishing Company.

Darling v. Charleston Community Memorial Hospital, 33 Ill.2d 326, 211 N.E.2d 253 (Ill. 1965).

Davis, C. K. (1986). Health-care reforms: What can we expect? Nursing Economics, 4(1), 10-11, 49.

Davis, F. A. (1987). Summary of research issues in quality of health care addressed at the Quality of Care Research Symposium, June 11-12, 1987 in Baltimore, MD. Working paper series, Department of Health and Human Services, HCFA, Office of Research and Demonstrations.

Deming, W. E. (1982). Quality, productivity, and competitive position. Cambridge, MA: Massachusetts Institute of Technology, Center for Advanced Engineering Study.

Dewar, R. & Hage, J. (1978). Size, technology, complexity, and structural differentiation: Toward a theoretical synthesis. Administrative Science Quarterly, 23, 111-136.

Division of National Cost Estimates, Office of the Actuary, Health Care Financing Administration. National health expenditures, 1986-2000. Health Care Financing Review. Summer 1987, 8(4), 24.

Donabedian, A. (1980). Explorations in quality assessment and monitoring: the definition of quality and approaches to its assessment (Vol. I). Ann Arbor, MI: Health Administration Press.

Dubois, R. W., Brook, R. H., & Rogers, W. H. (1987). Adjusted hospital death rates: A potential screen for quality of medical care. American Journal of Public Health, 77(9), 1162-1166.

Dubois, R. W., Rogers, W. H., Moxley, J. H., Draper, D., & Brook, R. H. (1987). Hospital inpatient mortality: Is it a predictor of quality? New England Journal of Medicine, 317(26), 1674-1680.

Durenberger, David (1986). Legislative perspective on health care in 1986. Nursing Economics, 4(1), 8.

Eggers, P. W. (1987). Prospective payment system and quality: Early results and research strategy. Health Care Financing Review (Annual Supplement), 29.

Farber, B. F., Kaiser, D. L., & Wenzel, R. P. (1985). Relation between surgical volume and incidence of postoperative wound infection. New England Journal of Medicine, 305(4), 200-204.

Flood, A. B., Ewy, W., Scott, W. R., Forrest, W. H., & Brown, B. W. (1979). The relationship between intensity and duration of medical services and outcomes for hospitalized patients. Medical Care, 17(11), 1088-1102.

Flood, A. B. & Scott, W. R. (1987). Hospital structure and performance. Baltimore, MD: Johns Hopkins University Press.

Flood, A. B. & Scott, W. R. (1978). Professional power and professional effectiveness: The power of surgical staff and the quality of surgical care in hospitals. Journal of Health and Social Behavior, 19, 240-254.

Flood, A. B., Scott, W. R., Ewy, W., & Forrest, W. H. (1982). Effectiveness in professional organizations: The impact of surgeons and surgical staff organizations on the quality of care in hospitals. Health Services Research, 17(4), 341-366.

Gertman, P. M. & Egdahl, R. E. (1978). The dynamics of utilization review: A case study of 44 Massachusetts hospitals. Annals of Surgery, 188(4), 544-551.

Ginsburg, P. B. & Hammons, G. T. (1988). Competition and the quality of care: The importance of information. Inquiry, 25, 108-115.

Ginzberg, Eli (1985). The restructuring of U.S. health care. Inquiry, 22, 272.

Glisson, C. A. (1978). Dependence of technological routinization on structural variables in human service organizations. Administrative Science Quarterly, 23, 383-392.

Goldfarb, M. G. & Coffey, R. M. (1987). Case-mix differences between teaching and nonteaching hospitals. Inquiry, 24, 68-84.

Goran, M. J. (1979). The evolution of the PSRO hospital review system. Medical Care, 17(5 Supplement), 1-47.

Griffith, H. (1986). Capital commentary. Nursing Economics, 4(1), 47-49.

Gross, P. A., Neu, H. C., Aswapokee, P., Antwerpen, C. V. & Aswapokee, N. (1980). Deaths from nosocomial infections: Experience in a university hospital and a community hospital. American Journal of Medicine, 68, 219-223.

Gross, P. A., Rapuano, C., Adrignolo, A., & Shaw, B. (1983). Nosocomial infections: Decade-specific risk. Infection Control, 4(3), 145-147.

Haley, R. W., Culver, D. H., White, J. W., Morgan, W. M., & Emori, T. G. (1985). The nationwide nosocomial infection rate. American Journal of Epidemiology, 121(2), 159-167.

Hebel, J. R., Kessler, I. I., Mabuchi, K., & McCarter, R. J. (1982). Assessment of hospital performance by use of death rates. Journal of the American Medical Association, 248(23), 3131-3135.

Hetherington, R. W. (1982). Quality assurance and organizational effectiveness in hospitals. Health Services Research, 17(2), 185-201.

Hobler, K. E., Corrigan, J. M., & Howlett, P. A. (1984). Biliary tract surgery: Cost versus quality of care in three hospitals. Quality Review Bulletin, (July), 203-208.

Hughes, R. G., Hunt, S. S., & Luft, H. S. (1987). Effects of surgeon volume and hospital volume on quality of care in hospitals. Medical Care, 25(6), 489-503.

Institute of Medicine (1976). Controlling the supply of hospital beds: a policy statement. Washington, DC: National Academy of Sciences.

Kaluzny, A. D. & Veney, J. E. (1980). Health service organizations: a guide to research and assessment. Berkeley, CA: McCutchan Publishing Corporation.

Kane, E. J. (1986). IBM's quality focus on the business process. Quality Progress, 19(4), 24-33.

Katz, P. S. (1986). Integrating quality assurance, utilization review, and risk management activities for the small hospital. Quality Review Bulletin, 12(3), 114-115.

Kelly, J. V. & Hellinger, F. J. (1986). Physician and hospital factors associated with mortality of surgical patients. Medical Care, 24(9), 785-800.

Knaus, W. A., Draper, E. A., Wagner, D. P., & Zimmerman, J. E. (1986). An evaluation of outcome from intensive care in major medical centers. Annals of Internal Medicine, 104, 410-418.

Kotelchuck, D. (1976). The health status of Americans. In D. Kotelchuck (Ed.), Prognosis negative: crisis in the health care system (pp. 5-30). New York: Vintage Books.

Lee, S. M. & Ebrahimpur, M. (1985). An analysis of Japanese quality control systems: Implications for American manufacturing firms. SAM Advanced Management Journal, 50(2), 24-31.

Levine, E. & Abdellah, F. G. (1984). DRGs: A recent refinement to an old method. Inquiry, 21:105.

Long, J. S. (1983). Confirmatory factor analysis. Beverly Hills: Sage Publications.

Luft, H. S. (1980). The relation between surgical volume and mortality: An exploration of causal factors and alternative models. Medical Care, 18(9), 940-959.

Luke, R. D. & Boss, R. W. (1981). Barriers limiting the implementation of quality assurance programs. Health Services Research, 16(3), 305-314.

Meyer, M. W. (1972). Size and the structure of organizations: A causal analysis. American Sociological Review, 37, 434-440.

Neuhauser, D. (1971). The relationship between administrative activities and hospital performance. Chicago: University of Chicago, Center for Health Administration Studies, Research Series 28.

Nollet, J. and Queirllon, R. (1988). Building quality assurance in. CA Magazine, (June), 36-40.

Ouchi, W. G. (1977). The relationship between organizational structure and organizational control. Administrative Science Quarterly, 22, 95-113.

Peters, J. D. & Olkowski, S. E. (1989). Hospitals' direct liability for medical malpractice--implications for the medical staff. The Medical Staff Counselor, 3(1), 25-34.

Peterson, K. D. (1984). Mechanisms of administrative control over managers in educational organizations. Administrative Science Quarterly, 29(12), 573-597.

Pfeffer. J. (1982). Organizations and organization theory. Boston: Pitman.

Pugh, D. S., Hickson, D. J., & Hinings, C. R. (1969). An empirical taxonomy of structures of work organizations. Administrative Science Quarterly, 14(3), 115-126.

Raelin, J. A. (1985). The basis for the professional's resistance to managerial control. Human Resource Management, 24(2), 147-175.

Reinhardt, Uwe E. (1986). Rationing the health-care surplus: An American tragedy. Nursing Economics 4(3), 101.

Restuccia, J. D. (1982). The effect of concurrent feedback in reducing inappropriate hospital utilization. Medical Care, 20(1), 46-62.

Richards, E. P. III & Rathbun, K. C. (1983). Medical risk management. Rockville, MD: Aspen Systems Corporation.

Roos, L. L. (1984). Surgical rates and mortality. Medical Care, 22(6), 586-588.

Roos, L. L., Cageorge, S. M., Austen, E., & Lohr, K. N. (1985). Using computers to identify complications after surgery. American Journal of Public Health, 75(11), 1288-1295.

Roos, L. L.: Cageorge, S. M., Roos, N. P., & Danzinger, R. (1986). Centralization, certification, and monitoring. Medical Care, 24(11), 1044-1066.

Rosen, H. M. & Feigin, W. (1982). Medical peer review and information management: The dead-end phenomenon. Health Care Management Review, (Summer), 59-66.

Sanazaro, P. J. & Worth, R. M. (1978). Concurrent quality assurance in hospital care. New England Journal of Medicine, 298(21), 1171-1177.

Shortell, S. M., Becker, S. W., & Neuhauser, D. (1976). The effects of management practices on hospital efficiency and quality of care. S.M. Shortell & M. Brown (eds) Organizational Research in Hospitals. Chicago: Blue Cross Association, 1976.

Shortell, S. M. & Hughes, E. F. (1988). The effects of regulation, competition, and ownership on mortality rates among hospital inpatients. New England Journal of Medicine, 318(17), 1100-1107.

Shortell, S. M. & Kaluzny, A. D. (eds) (1983). Health care management: a text in organization theory and behavior. NY: John Wiley and Sons.

Shortell, S. M. & LoGerfo, J. P. (1981). Hospital medical staff organization and quality of care: Results for myocardial infarction and appendectomy. Medical Care, 19(10), 1041-1054.

Smith, H. L. (1955). Two lines of authority are one too many. The Modern Hospital, 84(3), 59-64.

Spar, M. A. (1987). Virginia statistical abstract. Charlottesville, VA: Center for Public Service, University of Virginia, 13.

Staff of the Division of Education and the Division of Accreditation, Joint Commission on Accreditation of Hospitals (1986). Monitoring and evaluation of the quality and appropriateness of care: A hospital example. Quality Review Bulletin, 12(9), 326-330.

Tushman, M. L. & Nadler, D. A. (1978). Information processing as an integrating concept in organizational design. Academy of Management Review, 3, 613-624.

Van de Ven, A. H. (1976). A framework for organization assessment. Academy of Management Review, 1(1), 64-78.

Van de Ven, A. H. & Ferry, D. L. (1980). Measuring and assessing organizations. New York: John Wiley and Sons.

Wan, T. T. H. & Shukla, R. K. (1987). Contextual and organizational correlates of the quality of hospital nursing care. Quality Review Bulletin, 13 (2), 61-64.

Wenzel, R. P. (1985). Nosocomial infections, diagnosis-related groups, and study on the efficacy of nosocomial infection control. American Journal of Medicine, 78(Suppl 6B), 3-7.

APPENDICES

Appendix A

Dear QA Professional,

Thank you for taking the time to answer this short questionnaire regarding how some aspects of your hospital's quality assurance program is structured and functions. This questionnaire is part of my doctoral dissertation research at the Medical College of Virginia/Virginia Commonwealth University.

These questions apply to your quality assurance program as it existed during the last half of 1986. Please answer all of the questions as accurately as possible. All information will be kept in the strictest confidence. When you are finished with the questionnaire, please return it to me at the designated spot or, if necessary, mail it to:

[redacted]

If you would like to receive a summary of this research's findings, please mark the box below and provide your name and mailing address.

( ) Send me a summary of the findings. My name and address are:

I also request that you send me a copy of your hospital's current organizational chart. Thank you for your assistance.

Sincerely,

[redacted]

Patricia A. Rowell,
Doctoral Candidate
Department of Health Administration
Medical College of Virginia

QUALITY ASSURANCE QUESTIONNAIRE

I. General Information

1. Name of the hospital in which you work:

2. Name of the department in which you work:

3. Your job title:

4. In 1986, what was the job title of the person that the QA department reported to?

5. Quality assurance may mean different things in different hospitals. At your hospital, the QA department/committee relates to the following committees/departments by providing the following services (check all that apply):

	no services provided	liaison	problem identification	data collection & analysis	impose solutions/ sanctions	set/monitor standards
risk management						
utilization review						
mortality review						
tissue committee						
quality control						
departmental committees (e.g., medical, surgical, beds, etc.						
infections committee						
pharmaceuticals committee						
emergency care committee						
medical records committee						
blood utilization review committee						
credentialing committee						
other (specify						

II. Quality Assurance Activities

Directions:

Most of these questions ask you to circle one of several numbers that appear on a scale below the item. Corresponding with each number on a scale is a brief description of what the number represents. You are to circle the one number that most accurately reflects your answer to each question.

For example, if your answer to the following question is "very much" (and I hope it will be), circle the number "5" on the answer scale:

How much is it worth my time to fill out this questionnaire during the next few minutes?

NONE	LITTLE	SOME	QUITE A BIT	VERY MUCH
1	2	3	4	(5)

For the questions that ask you to write in information, please try to use the space provided. If additional space is needed, use the back of the page. Please write clearly.

When a question refers to professional QA personnel consider that to mean any individual whose formal work responsibilities involve the identification, assessment, and/or monitoring of the quality of hospital services for 50% or more of their work time. This would not include support personnel, such as secretaries or data entry personnel, whose roles are to support the professional staff, rather than assessment of the hospital's services.

The following questions relate to your hospital's quality assurance program during the last half of 1986. Please answer all of the questions based on how the program was structured and functioned during the last half of 1986. If you are unable to answer these questions, please ask someone who was familiar with the program during that time period to answer the questionnaire.

Thank you.

6. During the last half of 1986, for what percent of your work did you follow your hospital's standard operating procedures or practices?

0-20%	21-40%	41-60%	61-80%	81-100%
1	2	3	4	5

3

7. During the last half of 1986, what percent of your hospital's operating rules, policies, and procedures for the quality assurance program were written out in memos, reports, or a procedures manual?

0-20%	21-40%	41-60%	61-80%	81-100%
1	2	3	4	5

8. During the last half of 1986, how precisely did these hospital rules, policies, and procedures specify how your major tasks were to be done?

Very General	Mostly General	Somewhat Specific	Quite Specific	Very Specific
1	2	3	4	5

9. Listed below are five common decisions about QA work. During the last half of 1986, how much authority did you have in making each of the following decisions about your work?

	Amount of Authority QA Professional Has in Each Decision				
	None	Little	Some	Quite A Bit	Very Much
A. Decide what areas to assess for quality problems	1	2	3	4	5
B. Identify problems	1	2	3	4	5
C. Suggest solutions/ sanctions	1	2	3	4	5
D. Decide on solutions/ sanctions	1	2	3	4	5
E. Contact person responsible for problem area or problem	1	2	3	4	5
F. Decide on follow-up of problems	1	2	3	4	5

4

10. List the job titles of the professional QA personnel working during the last half of 1986. Also note the highest educational degree each had received and which were licensed/certified professionals (i.e., RN, MD, PT, RD, etc.):

QA Professional's Job Title	Professional Licensure/ Certification	High School Diploma	Associate Degree	Bachelors Degree	Masters Degree	Doctoral Degree
Example: QA coordinator	RN		X			

11. (a) During the last half of 1986, how many FTEs (1 person working 40 hours/week = 1 FTE) were assigned to the QA program? Include both professional and nonprofessional personnel. _____ FTEs

(b) Of these FTEs, how many were full-time? _____ full-time

(c) How many of these FTEs were QA professionals and how many were support personnel (i.e., secretaries, computer specialists, etc.)?

_____ FTEs QA professionals _____ FTEs support personnel

12. During the last half of 1986, if you had more than one professional QA staff member, how easy would it have been for these personnel in your hospital to rotate jobs, so that each could do a good job performing the other's tasks?

Very difficult. Most personnel would need extensive training.	Quite difficult Some personnel would need extensive training.	Somewhat difficult. A few personnel would need retraining.	Quite easy. Some personnel would need minor training.	Very easy. No personnel would need training.
1	2	3	4	5

5

13. During the last half of 1986, how much influence do you think each of the following had over the functioning of the QA program?

	Amount of Influence				
	None	Little	Some	Quite A Bit	Very Much
A. The QA staff	1	2	3	4	5
B. Physicians	1	2	3	4	5
C. Hospital Board of Directors	1	2	3	4	5
D. Nurses	1	2	3	4	5
E. Other health care professionals	1	2	3	4	5
F. Support personnel (i.e., housekeeping, etc.	1	2	3	4	5
G. Hospital administration	1	2	3	4	5

14. During the last half of 1986, how satisfied were you with each of the following:

	Very Unsatis-fied	Quite Unsatis-fied	Somewhat Satis-fied	Quite Satisfied	Very Satisfied
A. Number of QA personnel assigned to QA activities	1	2	3	4	5
B. Financial resources provided for QA activities	1	2	3	4	5
C. Management's commitment to QA	1	2	3	4	5
D. Professional staff's (MD, RN, OT, PT, RD, psychologists, etc.) commitment to QA	1	2	3	4	5
E. Non-professional's (housekeeping, dietary, nurses' aides, etc.) commitment to QA	1	2	3	4	5
F. Hospital Board of Directors' commitment to QA	1	2	3	4	5

15. What was your approximate QA budget for FY 86? $_____

Thank you very much.

Appendix B Non-normalized Values for Size and Specialization Indicators

Indicator	N	Mean	S.D.
HOSPBD	64	221.89	152.26
EXPEND	68	28.219×10^6	31.837×10^6
FTEH	68	676.31	629.04
PCTRN	68	71.65	15.77
SPECARE	64	18.95	21.89
BRDCERT	68	70.32	16.75
TRANSIN	69	0.01	0.02
PCTSURG	69	23.83	8.24
MIX	69	1.12	0.11

Note:
N = sample size
S.D. = standard deviation

Appendix C Unexpected Death Regressed on Selected Organizational Variables

Predictor	intercept	r	B	r	F	t-value	
HOSPBDN	0.002	0.165	-0.0004	0.01	1.741	-1.319	
EXPENDN	0.005	0.108	-0.0003	0.02	1.789	-1.338	
FTEHN	0.003	0.115	-0.0003	0.01	1.904	-1.380	
BRDCERT	0.003	0.294	$-3x10^{-5}$	0.09	7.345*	-2.2710*	
SPECAREN	0.0003	0.126	$4x10^{-5}$	0.02	0.032	0.179	
PCTRN	-0.00003	0.101	$7x10^{-6}$	0.01	0.324	0.567	
MIXN	0.0006	0.123	$-1x10^{-5}$	0.02	0.006	-0.078	
PCTSURG	0.0009	0.069	0.0009	0.005	0.687	-0.829	
TEACH	0.0005	0.094	$-1x10^{-4}$	0.009	0.415	-0.644	
ALOSN	-0.001	0.085	$7x10^{-4}$	0.007	0.513	0.716	

Note:

* statistically significant at 0.05 level or lower
B unstandardized regression coefficient
r zero-order correlation coefficient between the dependent and independent variable.

Appendix D Quality Assurance Design and Resource Characteristic Regressed on Hospital Size (HOSPBDN)

Predictor	Intercept	r	B	r^2	F	t-value
PLICENSE	-1.756	0.28	0.602	0.08	5.49*	2.34*
EDUCATION	-2.735	0.36	0.727	0.13	8.84*	2.97*
PERSONAL	0.010	0.27	-0.001	0.07	4.45*	-2.13*
PROPT	0.008	0.30	-0.001	0.09	5.73*	-2.39*
DISCRET	87.55	0.14	-5.02	0.02	1.05	-1.03
QATROL	4.57	0.025	0.099	0.0006	0.03	0.18
FORMAL	98.11	0.20	-6.99	0.04	2.17	-1.47
QASPREAD	24.29	0.03	0.90	0.001	0.08	0.29

Notes:

* statistically significant at 0.05
B unstandardized regression coefficient
r zero-order correlation coefficient between the dependent and independent variable

Appendix E Quality assurance design and resource characteristic regressed on hospital specialization (BRDCERT)

Predictor	Intercept	r	B	r^2	F	t-value
PLICENSE	0.729	0.11	0.009	0.013	0.85	0.36
EDUCATON	-0.053	0.20	0.016	0.04	2.71	1.64
PERSONAL	0.007	0.27	-4.1×10^{-5}	0.07	4.44*	-2.11*
PROPT	0.005	0.27	-3.37	0.07	4.45*	-2.11*
DISCRET	57.03	0.05	0.05	0.002	0.09	0.31
QATROL	4.46	0.06	0.010	0.004	0.23	0.48
FORMAL	41.21	0.10	0.140	0.01	0.63	-0.79
QASPREAD	20.82	0.10	0.115	0.01	0.95	0.97

Note:

* statistically significant at 0.05 level or lower
B unstandardized regression coefficient
r zero-order correlation coefficient between the dependent and independent variable

Vita

[redacted]