# NURSING INFORMATICS AND HOSPITAL DECISION MAKING: THE USE OF INFORMATION GENERATED BY AN AUTOMATED PATIENT CLASSIFICATION SYSTEM

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# DEDICATION

In loving memory of

my parents

Betty Jane Knighton Botter and David E. Botter Jr.

and

my grandparents

Lou Ethel Botter and David E. Botter Sr.

Florence G. Knighton and Joseph Wilson Knighton

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ABSTRACT

NURSING INFORMATICS AND HOSPITAL DECISION MAKING:
THE USE OF INFORMATION GENERATED BY
AN AUTOMATED PATIENT CLASSIFICATION SYSTEM

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Automated patient classification systems (PCS) are widely used throughout the United States. Their intended purpose is to generate information to be used in decision making by and for nurses and nursing services. Expenditures for this type of information technology are significant, yet no previous research had been conducted regarding the actual use of information generated by an automated PCS. Thus, the purpose of this research was to describe if, how, and why information obtained from an automated PCS is used in hospital decision making.

A qualitative design was used for this organizational case study. The study was conducted in a university teaching hospital that used the Medicus PCS. Purposive and theoretical sampling led to interviews with 67 informants. Observations and documents were also used as sources of data. A constant comparative method was used for data analysis.

An interpretive description of how and why PCS information is used in hospital decision making was an outcome of this research. Seven categories emerged from

analysis of the data. Six categories pertain to how patient classification information is used in decision making. These categories include "planned use", "actual use", "actual non-use", "people use it differently", "consistency of use", and "PCS information as one component of decision making". One category "factors influencing use" relates to why PCS information is used, or not used, in decision making.

Results from this study support the theory that multiple perspectives of information use in organizational decision making are necessary to reflect this complex process. Although the majority of the findings from this study are consistent with the literature, there are some exceptions. One is of particular interest. The PCS literature suggests that reliability and validity of a PCS influence use of the generated information. Results from this study do not support this assumption.

Several recommendations for nurse administrators and PCS vendors resulted from this study. The findings from this research also suggest implications for theory development. Work toward a theoretical framework of information use in organizational decision making may be facilitated by the nine propositions induced from the case study data.

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## CHAPTER 1

## INTRODUCTION

The health care industry has been undergoing revolutionary changes during the past decade, and this trend promises to continue. Advances in technology, alterations in methods of reimbursement, and changes in societal values and priorities are identified as major forces influencing health care services in the United States (American Hospital Association [AHA], 1992).

Since the early 1980s, health care and nursing administration literature have emphasized the need for executives to examine nursing services in light of increased competition and reductions in reimbursement. Particular attention has focused on the allocation and utilization of resources. Organizational decision making regarding resource use has been considered imperative for organizational survival (AHA, 1992; Anderson, 1990; Goldman, 1990; Hillestad & Berkowitz, 1991; Lathrop, 1993; Sherman, 1993).

The use of automated information systems in hospitals began receiving attention as the pressure to allocate resources efficiently increased. Some executives, recognizing the rapid advancement of information technology explored the benefits of purchasing systems to assist in

management decision making. Articles reported applications of various information systems, and provided information and advice regarding the acquisition of such systems. Journals relayed information about rapid technological advances that enabled the timely provision of information to managers. Benefits of management information systems were extolled and related to efficient management as reflected by the bottom line. In many hospitals across the country, information systems were implemented with the expectation that the systems would result in tangible financial benefits for the organization (Glaser, Drazen, & Cohen, 1986).

Nursing service costs account for the largest part of the operating budget of hospitals (Bigbee, Collins, & Deeds, 1992). Thus, departments of nursing were identified as major sources of potential savings. Hospital executives, including nurse executives, recognized the vital role of nurses in the allocation of resources for provision of care. In addition, nurse executives envisioned many other possibilities for the use of automated information systems. Purchase of automated information systems designed to meet nursing management needs was thus supported in many hospitals. The nursing literature of the 1980s and 1990s reflects the increased interest and use of nursing information systems and other computer applications.

Patient classification systems (PCSs) were among the first automated information systems designed for use by

nurses. To a great extent, the creation of these automated systems was driven by emphasis placed on patient classification by nurse administrators and the Joint Commission for Accreditation of Hospitals. In addition, conversion of existing manual systems provided opportunities for entrepreneurs. Hospitals that used manual PCSs viewed the change to automated systems as desirable. Those hospitals without existing PCSs obtained automated systems because of their desire to manage staff resource allocations more effectively. Thus, automated PCSs became the first widely purchased automated systems for nursing.

Though the organization of hospitals and the provision of nursing care has changed and is continuing to change, automated PCSs continue to be widely used in acute care settings throughout the United States (DeGroot, 1994a). Their primary purpose is to generate information to be used in decision making by and for nurses and nursing services. As such, PCSs may be considered a type of nursing informatics (Hannah, Ball, & Edwards, 1994).

As a society, we are experiencing the information age. We accept the notion of information as a resource and embrace the continuing development of information technology. Literature on decision making reveals little ambiguity about the importance of information. Though there is agreement on the importance of information, its role in the decision making process is poorly understood. Currently,

few models address the use of information in decision making, and no fully articulated model linking information and the use of information within the decision process exists. There is however, evidence that information which is provided through information systems is not always used even when available (Browne, 1993).

Hospitals are allocating more of their budgets for the purpose of adding and upgrading information technology, yet there are few empirical data to indicate whether the information produced is actually utilized. The potential for nursing informatics to assist nurses and hospital administrators in decision making is widely recognized and well documented (Adaskin, Hughes, McMullan, McLean, & McMorris, 1994; Barton, 1994; Fralic, 1989; Hannah et al., 1994). However, while technology allows for access to patient classification information for decision making, no studies had been conducted regarding the actual use of the information generated by these automated systems. With the ever increasing pressure to contain costs, consideration must be given to the cost of acquiring and utilizing information technology in relation to the benefits accrued. This study of the actual use of information generated by an automated PCS provides insight into the use of nursing informatics for hospital decision making.

## Problem Statement

PCSs were developed as a tool for nurses to classify

patients by level of acuity as defined by their nursing care needs. Numerous uses for PCS information have been described in the literature such as assessment of patient care needs, allocation of staff, budgeting, costing out nursing services, billing, cost control, quality assurance and research (Adams, 1995; Buckle, Horn, & Simpson, 1991; DeGroot, 1994a, 1994b; Des Ormeaux, 1977; Dijkers & Paradise, 1986; Fawcett, 1985; Finkler, 1991; Georgette, 1970; Giovannetti, 1972, 1978, 1979; Kirk & Dunaye, 1986; Van Slyck, 1982, 1991a, 1991b). Improved management, strategic planning, and integration of nursing department systems with other hospital systems are purported to be benefits of the use of reliable PCS information by nurse administrators (Donaho & Haas, 1984; Finnegan, Abel, Dobler, Hudon, & Terry, 1993; Lewis, 1989; McAlindon, Silver, & Edwards, 1986; McHugh, 1986; Saba & McCormick, 1986; Sherman & Jones, 1995; Van Slyck, 1991b).

However, there is only one study regarding the use of PCS information (Krause, 1988). This exploratory descriptive study was conducted to determine the uses of patient classification information by nursing departments in eastern Wisconsin. Data were collected by means of a questionnaire mailed to a convenience sample of nurse administrators from 61 acute care hospitals. Fifty-two percent of the questionnaires were returned, however, the number of responses reflecting the use of automated systems was not

reported. Fifty-six percent of the respondents indicated their PCS had been in place one year or less. The most common use of patient classification information was to assist the nursing department with staffing decisions. Most respondents indicated interest in utilizing patient classification information for the development of nursing personnel budgets and costing out nursing care, yet, few had actually used the information for these purposes. Krause (1988) recommended revision of the instrument prior to replication of the study. She advocated further research on the actual uses of PCS information by individual nursing departments, the nursing community as a whole and by other members of the hospital team.

With the conduct of only one study focused on the use of patient classification information, little is known about the actual use of this information in hospital decision making. An understanding of the uses of patient classification information is necessary to provide opportunities for continued system development to meet current and future needs. Knowledge regarding the factors that influence use of patient classification information is particularly important for nurse administrators. A system that is inadequately, inappropriately, or not used is an expense without benefit. Additionally, since patient classification information is generated for the purpose of decision making, a study regarding its actual use

contributes to knowledge about information use in organizational decision making.

The purpose of this organizational case study was to describe how and why information obtained from an automated nursing PCS is used by hospital personnel in decision making. Specifically the study focused on the following questions:

1. How is patient classification information used by hospital personnel in decision making?
    a. In what types of decisions is patient classification information used?
    b. What hospital personnel use patient classification information in decision making?
    c. To what extent is patient classification information used in these decision making processes?
2. Why is patient classification information used as the basis for some decisions and not others?

A qualitative design was used for this organizational case study to enhance the understanding of the influence of context on the use of information in decision making. Interviewing was the major method of data collection. The use of a constant comparative process for data analysis resulted in an interpretive description of how and why

patient classification information is used in hospital decision making. Study findings contribute to knowledge regarding the use of patient classification information, and also inform organizational decision making theory.

Several recommendations for nurse administrators and PCS vendors resulted from this study. Additionally, the findings from this research suggest implications for theory development. Further work toward a theoretical framework of information use in organizational decision making may be facilitated by the propositions induced from case study findings.

## Definition of Terms

Definitions of key terms used in this study are presented here for the purpose of clarity and consistency.

Automated Information System:

> An open system that uses hardware and software to process data into information (Saba & McCormick, 1986).

Decision Making:

> "The process of considering alternative courses of action and the choosing of an alternative for implementation" (Browne, 1993).

Information:

> Data (facts) that have been processed to produce a structured form (information) as a result of processing (Saba & McCormick, 1986).

Information Use:

The term information use implies a range from no use to complete use of a specified type of information in decision making.

Nurse Manager:

A registered nurse responsible for managing the care of patients, a patient care unit, or a group of patient care units (Marquis & Huston, 1992). (Not to be confused with the criteria used by the National Labor Relations Board).

Nursing Information System:

An information system designed to provide information needed by nurses for decision making (Hannah et al., 1994).

Nursing Informatics:

"Use of information technologies in relation to those functions within the purview of nursing" (Hannah et al., 1994, p. 5).

Patient Classification:

A process whereby patients are categorized according to an assessment of their needs for nursing care (Medicus Systems Corporation [MSC], 1993).

Patient Classification Systems:

"The identification and classification of patients into care groups or categories, and...quantification of these categories as a measure of the nursing effort required" (Giovannetti, 1979, p. 4).

Short Term Hospital:

A health care facility with an average length of stay of less than 30 days (AHA, 1986).

# CHAPTER 2

# REVIEW OF THE LITERATURE

Information use in organizational decision making provides the framework for this case study regarding nursing informatics and hospital decision making. Thus, literature regarding organizational decision making and informatics comprise the two major components of this literature review. Discussion of PCSs, including a brief description of the Medicus PCS utilized in this study, will be incorporated in the informatics section of this literature review. A discussion of research focusing on the use of nursing informatics and hospital decision making will conclude this chapter.

## Organizational Decision Making

Within hospitals, as in all organizations, decision making is necessary for the transformation of organizational inputs. "Decision making is a process by which a(n)...organization identifies a choice or judgment to be made, gathers and evaluates information about the alternatives, and selects from among the alternatives" (Carroll & Johnson, 1990, p. 19). Decision making is considered to be one of the primary activities in an organization (Giesecke, 1994).

Multiple theories exist regarding organizational decision making. Normative models, such as the traditional theory of the economists, assume complete rationality. These

theories are based upon the Weberian view of organizations as rational bureaucracies (Clark, 1985). This view suggests that decision makers follow a highly rational procedure for making decisions, selecting the best course from all those available to maximize the returns. Rational models assume that decision makers know their preferences and the alternatives available, have access to information regarding the consequences of each alternative, and objectively consider each possible outcome (Carroll & Johnson, 1990; Giesecke, 1994; Pugh, Hickson, & Hinings, 1985; Zhou, 1997).

From the 1940s to the 1970s, the rational model guided the majority of organizational research and theory development. Though this work contributed significantly to the field, the continued use of the rational paradigm is now considered to limit our understanding of organizations (Clark, 1985; Day & Nedungadi, 1994; Pfeffer, 1982). Recently, the literature has reflected an ever widening gap between the rational model and its modifications and a body of research suggesting that decision making in organizations often departs substantially from the rational ideal (Clark, 1985; Evan, 1980; Giesecke, 1994; Heller, 1992; March 1997; Mintzberg, 1989; O'Reilly, 1983; Pfeffer, 1982; Shapira, 1997).

Browne (1993) categorized the various approaches to decision making as classical/rational, bounded rationality, and political. As mentioned previously, the

classical/rational models are based upon the assumption that humans are entirely rational beings. The bounded rationality models are descriptive in origin, and are based upon assumptions that significantly differ from those used in the rational approach. These models acknowledge that individuals and organizations have information processing limitations. Thus, there are limits on the amount and accuracy of information available, and on the number of alternatives considered. Additionally, the consequences of choices or actions are uncertain (March, 1997). According to Cyert and March (1963) and March (1988, 1997), one of the key characteristics of decision situations is that the first satisfactory alternative found in the search is accepted. "Satisficing" thus replaces maximizing of outcomes, which is characteristic of the rational model.

Political models, on the other hand, emphasize compromise, bargaining, and the use of power in the decision process (Giesecke, 1994; Morgan, 1986; Pfeffer, 1987). Politics provide for the management of dependencies and the satisfaction of individual, group, or organizational interests (Salancik & Brindle, 1997). Thus, decision making is considered to be an exercise in balancing the demands and interests of stakeholders in the organization (Morgan, 1986; Pfeffer, 1987; Pfeffer & Salancik, 1974). Decisions are influenced by dependencies and current distributions of power in organizations (Salancik & Brindle, 1997).

The anarchic, or garbage can model, is viewed as separate by some (Giesecke, 1994; Magjuka, 1988), but Browne (1992) categorizes this model as political. Problems, solutions, and participants are considered to be independent streams that come together in decision making opportunities (Giesecke, 1994). Decision making situations, or choice opportunities, are viewed as garbage cans into which problems and solutions are dumped (Magjuka, 1988). If the timing is right, a decision will occur. If not, an issue may move to another decision opportunity, may be resolved elsewhere, or may be abandoned only to resurface at a later time (Giesecke, 1994).

The inconsistency between rational models of decision making and empirical findings concerning decision making has been widely acknowledged (Browne, 1993; Clark, 1985; Hickson, 1987; Mandell, 1989; March, 1981, Nutt, 1984). Thus, contemporary beliefs about decision making in organizations are largely based upon the bounded rationality and political perspectives (Browne, 1993).

Recent research has, however, contributed to the development of yet another perspective of organizational decision making. March (1997) and Zhou (1997) describe organizational decision making as "rule following". There is mounting evidence that organizations tend to adopt simple rules for the purpose of decision making. Thus, a significant amount of organizational decision making may be

characterized as rule-following behavior. Rule following refers to predictable patterns of behavior that are based upon implicit or explicit rules. Implicit rules include norms and standards, while explicit rules include formal regulations, policies, and procedures. The logic of appropriateness is followed in rule following, in contrast to the logic of optimization followed in rational choice models. Additionally, rules are constructed by social processes that are independent of specific decision processes. Whether this perspective should be considered a completely separate model or a type of bounded rationality is not addressed in the literature.

A number of individuals value all perspectives of organizational decision making. Although the categories identified by Browne (1993) are presented as though they are mutually exclusive, Browne (1993) acknowledged that they are not entirely independent of each other. In fact, the findings of Browne's study on organizational decision making suggested that "the literature of decision making has exaggerated the differences between the ...models of decision making" (p. 185). Findings of a study conducted by Enderud (1980) also support the use of multiple decision models to understand decision making. He found that the decision process takes on the characteristics of various models as it moves through time. March (1997) suggested that multiple perspectives of decision processes in organizations

are all correct. He advocated weaving them together in a way that allows each perspective to illuminate the others.

Views that challenge rather than modify the classical view of organizations influence the study of decision making processes in organizations (Clark, 1985). Since different models represent different variables relevant to the decision process (Pfeffer & Salancik, 1974), decision making must be examined from multiple perspectives to discover the process actually in use in organizations. Shapira (1997) also supports "cross-pollination" (p. 6) of various research traditions and perspectives to analyze decisions made in, and by, organizations.

## Use of Information in Organizational Decision Making

Few theories specifically address the use of information in decision making. However, most descriptions of the decision process assume a role for information (Browne, 1993). The literature reflects numerous conceptualizations. Factors influencing the use of information are explicitly stated in some theories, and are implicit in others.

Organizational decision making research has focused on information in various ways. For example, several investigators have explored the link between information acquisition, sources, and types with various aspects of the decision process (Connolly, 1977; Saunders & Jones, 1990). McClure (1980) examined the relationship between the amount

of routine in a job and the number of information sources. The flow of information in organizations has also been studied (Browne, 1993). While there are additional examples of research including information as a variable in organizational decision making, few studies focus specifically on the actual use of information in this process.

McClure (1980) studied decision making in an academic library. The hypothesis that individuals with large amounts of information will tend to be involved in decision making was not supported. However, McClure did find a correlation between individuals with less routinized jobs and increased contact with information sources. This finding lends support to the influence of job characteristics on information use.

The use of performance information by school system administrators was studied by Sproull and Zubrow (1981) as part of a research program on the social functions of standardized testing. They found that test scores seldom stimulated action by school administrators. In fact, in only six cases out of 116 was test score information used as the basis for action. Administrators reported using information from personal observation, teacher reports, and conversation with other personnel for decision making related to organizational performance. The investigators use an information processing perspective to interpret their findings. They suggest that administrators search their

environment for information with characteristics that match the task at hand, and use information that is immediate, personal, and targeted even if the information available is not optimal.

A descriptive study conducted by O'Reilly (1982) examined variations in the use of information sources by welfare eligibility workers. The frequency of use of three of the four major information sources (files, updates, group, external) available to respondents was explained by accessibility of the source. Only in the use of the group, an easily accessible source to all eligibility workers, was quality a predictor of frequency of use.

The use of scientific-technical information in governmental research and development decisions was examined by Desai and Crow (1983). The findings from this case study indicate that a major research and development decision was based on inadequate use of available and relevant technical information. An analysis of this decision process suggests that politics are likely to preclude the use of relevant technical information in decision making.

Williams and Bank (1984) examined the use of instructional information systems in two school districts. They found that the information system played only a minor role in decision making by school councils in one school district, though the information did sometimes corroborate perceptions formed in response to other input. In the other

school district, the information system was often used to influence teaching practices. The researchers hypothesized that the different levels of use of the two instructional information systems depended in part on the significance of the decisions which the systems were meant to inform, the compatibility of the system with the culture of the schools, and the users' perceptions of the validity of the data.

McClure and Samuels (1985) conducted a study focusing on factors affecting the use of information for library decision making. The findings from their study indicate that proximity relates to information use. The closer and more familiar a source, the more likely it is to be used. In addition, information used by academic librarians tends to be opinion based rather than empirically based.

Two competing hypotheses regarding the utilization of information were the basis for a study involving social service decision makers (Majchrzak, 1986). One perspective indicated that information will be used if it is relevant, timely, and comprehensible. The alternative hypothesis suggested that information will be used when organizational rewards and incentives encourage its use. Evidence supporting both hypotheses was found. In addition, the findings suggest that the information type used by a decision maker is predicted in part by the type of decision needing to be made. However, the use of a particular information source is related to the decision maker's role.

Three organizations were the focus of research conducted by Langley (1989) regarding the role of formal analysis in strategic decision making. As an essential component of analysis, information was a focus of this research. Langley found that an important motive for conducting a formal analysis was the collection of information used to justify a proposal to others. In addition, people used information to confirm opinions and to verify other information sources. Thus, information collection and use in the analysis process was often influenced by the opinions and goals of those involved in conducting formal analysis studies.

Molloy (1990) conducted a case study of four organizations regarding the factors affecting the use of information technology in strategic decision making. The study findings indicated that information technology is used less often for those decisions identified as crisis decisions. Two factors were found to positively influence the use of information technology. User experience with a specific information system and organizational support for a specific information technology positively influenced the use of information generated by the system.

Perkins and Rao (1990) studied the role of experience in the use of information in decision making by marketing managers. Findings suggested that experienced managers use more sources of information when making unprogrammed

decisions, while experience does not markedly influence information use for programmed decisions. Perkins and Rao concluded that experienced managers differ from novices in both their use of information and in the decisions they make.

A study examining the use of information for decision making by U.S. Army officers was conducted by Averett (1991). Various sources of information, including information generated by an electronic system were considered. Averett concluded that the use of information in decision making is based upon personal cognitive style and organizational influences.

Florio and DeMartini (1993) examined how community policy makers use information in making decisions. Findings from the study support the framework developed by Weiss (1983). That is, the use of any type of information is a part of a complex process involving multiple sources of information, as well as the ideology and interests of the decision makers. Florio and DeMartini concluded that the use of information is dependent on a particular set of circumstances involving an interaction of information, and the ideology and interests of the decision maker in relation to the topic.

Browne (1993) used two models of decision making and information as the basis for his research: the bounded rationality and anarchic models. Complex decision processes

at the highest management level in a university setting were examined. Browne found that information was used more often when it was written and was considered authoritative. Additionally, the findings indicated that information on other alternatives is not actively pursued after an alternative has been chosen. Browne concluded that the bounded rationality model has strong descriptive power. However, this model did not account for all aspects of information use in the decision process. For example, information is not always used in the act of choice leading to implementation of the alternative selected to resolve the problem. The anarchic model did not account for the major aspects of the decision making process, though some of the elements of the model were supported. For example, information was used to legitimize the decision process. Browne recommends using an information centered view of decision making to avoid the traditionally dichotomous views of organizational decision processes.

Bourgeois and Nizet (1993) conducted a case study to examine strategies used in a decision process to create a university based, non-traditional degree program. Information was frequently used to directly or indirectly influence the decision process. Acquiescence from others was obtained through the use of information selected or biased for that purpose. Additionally, information was used to legitimize decision procedures and outcomes. The use of

information in this manner was preferred by individuals involved in the decision preparation process rather than those in charge of making the final decision.

A study conducted by Latham and Whyte (1994) examined the influence of utility analysis on decision making. Utility analysis provides information to help managers decide whether to invest in human resource management systems. The 143 managers in this laboratory study did not base their decisions on the costs and benefits presented in a utility analysis, or on information conveyed in an expectancy table. Instead, they selected the only option presented without quantitative data. Latham and White concluded that managers often do not rely on rational models. However, they suggest that further research is needed regarding influences on the use of information in decision making.

While research focusing on actual use of information in organizational decision making is limited, the findings from these studies confirm the complex nature of information use in decision processes. Empirical evidence provides support for many of the influences on information use identified in the literature. Characteristics of the problem, or decision situation, influence the type and amount of information used (Majchrzak, 1986; Molloy, 1990; Perkins & Rao, 1990; Sproull & Zubrow, 1981; Williams & Bank, 1984). Presentation and perception of the information presented were also found to

influence use of information (Browne, 1993; Latham & Whyte, 1994; Majchrzak, 1986; Sproull & Zubrow, 1981; Williams & Bank, 1984). Additionally, accessibility and familiarity are associated with information use (McClure & Samuels, 1985; Molloy, 1990; O'Reilly, 1982). Opinions and goals of individuals, groups and organizations influence use of information in decision making (Averett, 1991; Bourgeois & Nizet, 1993; Desai & Crow, 1983; Florio & DeMartini, 1993; Langley, 1989, Molloy, 1990). The experience and role of decision participants influences information use as well (Majchrzak, 1986; McClure, 1980; Perkins & Rao, 1990). Information use is also influenced by the selection of an alternative or a decision for action (Bourgeois & Nizet, 1993; Browne, 1993; Langley, 1989). Interestingly, information quality and relevance are not identified as strong influences on information use in the decision process (Desai & Crow, 1983; O'Reilly, 1982; Sproull & Zubrow, 1981).

The findings from the studies reviewed above support the theory that there are multiple and interacting influences on the use of information in organizational decision making. In contrast to the original assumptions in the rational decision models, research findings indicate there is not a linear relationship between information and decisions. In fact, many factors influence the use of information in organizational decision making. The diversity

of findings indicate that a paradigm or even a convergence of the literature has yet to be realized. Understanding of the use of information in decision making is far from complete. The theme common to the studies described above, as well as the current theoretical literature regarding decision making, is the conclusion that further research must be conducted. As Perkins and Rao (1990) state, "the formal study of decision making by practicing managers has enormous potential because surprisingly little is known" (p. 9).

## Informatics

As a society we know little about the actual use of information in decision making, however, we value information as a resource. Major technological advances created the information age, and continue to spur the development of information technology.

Informatics is a combination of computer science and information science (Gorn, 1983; Graves & Corcoran, 1989; Ozbolt & Graves, 1993). When combined with the science of a particular discipline, such as nursing, "it denotes an application of computer science and information science to the managing and processing of data, information and knowledge in the discipline" (Graves & Corcoran, 1989, p. 227). Thus, nursing informatics refers to the "use of information technologies in relation to those functions within the purview of nursing" (Hannah et al., 1994, p.5).

Nursing management information systems (NMIS) are one type of information technology commonly used in hospitals. These systems support administrative functions to facilitate the delivery of nursing services (Graves & Corcoran, 1989). Management information systems (MIS) process data into information to support management activities and functions. Specifically, they manage the flow of information in an organization in a timely manner and assist in the decision making process (Saba & McCormick, 1986).

According to Saba and McCormick (1986) a MIS provides information to satisfy the structure and functions of an organization. Hospital structures are commonly described as having three levels of management; top, middle and lower. Each of these levels has a functional area of control; strategic planning, management control and operational control (Anthony, 1965).

The strategic planning function in an organization refers to policy decisions made by top level administrators. In a hospital setting, this would typically include the chief executive officer, chief operating officer, chief financial officer, and the chief nurse executive. These individuals require information to administer daily hospital operations as well as for planning and forecasting purposes. Program and personnel decisions, the management control function, are made by middle level managers such as nurse managers and supervisors. They require information to

measure performance, and to control, plan and allocate resources. The operational functions of managing, coordinating, and providing patient care are made by the lower level care managers such as charge nurses and staff nurses. Information generated by a MIS flows horizontally and vertically, and provides all levels of personnel with information to be used in the process of decision making (Saba & McCormick, 1986).

Management information systems are commonly developed to meet the needs of specific user groups. PCSs were developed for use by nurses, and are considered nursing management information systems (Saba & McCormick, 1986). The information generated by PCSs is thus part of the input available for the process of decision making by nurses as well as other individuals and groups responsible for decisions affecting the nursing department and patient care.

## History of PCSs

Historically nurses have been concerned with identifying patients' requirements for nursing care. Nightingale (1859) first documented the classification of patients by their nursing care needs in Notes on Hospitals. She referred to the grouping of patients by the different amounts of care they required, identifying three categories; convalescents, sick, casualty. Nightingale recommended patients be placed in wards accordingly to facilitate efficiency in the allocation of nurses and the provision of

nursing care to meet patient care needs.

Modern PCSs have evolved from work started in the 1950s at U.S. Army hospitals (Claussen, 1955) and Johns Hopkins Hospital (Connor, 1960; Connor, Flagle, Hsieh, Preston, & Singer, 1961). These organizations developed systems for defining nursing care needs of patients. The purpose of these systems was to "predict and develop utilization patterns built on the nursing needs of the individual patients" (Claussen, 1955, p. 209). Thus, PCSs were initially developed as tools to facilitate decision making regarding staffing and patient placement for effective utilization of resources (Claussen, 1955; Connor, 1960; Connor et al., 1961).

Two basic types of PCSs exist. They were described by Abdellah and Levine (1965) as the prototype evaluation system and the factor evaluation system. The difference between them relates to the design of the classification instrument. The prototype system provides a number of categories which describe characteristic care needs for patients typical to each category. Patients are assigned to a category based upon their identified nursing care needs at the time of classification. A specific number of points is assigned to each category and entered into an equation to determine nursing or unit workload. In contrast, patients are rated through the use of critical indicators or descriptors of care in the factor evaluation system. Each of

the appropriate indicators is selected, and then combined to designate a patient's category. Points are assigned to each critical indicator. Acuity levels for each patient, as well as a unit workload, are then calculated. While the prototype evaluation system is commonly thought to be more subjective than the factor evaluation instrument, Giovannetti (1979) stated that "some measure of subjectivity is inevitably involved in any assessment of patients' nursing care requirements" (p. 5). Currently, the majority of PCSs use a factor evaluation type of instrument (Barnum & Kerfoot, 1995; Kelleher, 1992; Lewis, 1989).

With the development of computer technology, increasingly complex PCSs, and the advent of prospective payment, the automation of PCSs became common. All major PCS vendors have computerized their systems, and many hospital developed systems have been converted as well. PCSs are considered to be a type of nursing management information system, generating information to be used in decision making (Saba & McCormick, 1986).

Medicus

The Medicus PCS was developed between 1971 and 1973 as a joint research effort between the Medicus Corporation and Rush Presbyterian-St. Luke's Medical Center in Chicago, Illinois. Continuous research and development efforts by the Medicus Systems Corporation in collaboration with hospitals across the United States have resulted in multiple revisions

over the years. The most recent revalidation of the patient classification methodology was completed in 1993. Currently, the Medicus PCS is used in over 400 U.S. hospitals and all users have upgraded to an automated version of this factor evaluation system (A. Verona, personal communication, August 1994). A data base of patient classification information has been established and continues to be further developed. Comparative information is disseminated annually to member hospitals.

The Medicus patient "classification instrument is a factor evaluation tool in which weighted critical indicators are utilized to objectively categorize patients into groupings" (MSC, 1993, p. 35). This instrument is used in all patient areas and classifies patients into one of six types depending upon nursing care needs. The focus on patient's needs for nursing care as a measure of nursing workload, rather than nursing tasks, provides the basis for this classification system (MSC, 1993).

The development of critical indicators used for the purposes of classification resulted from factor and regression analyses. These approaches were used to determine the degree to which each indicator could be predictive of nursing care requirements. In addition to identifying indicators, the results of these analyses provided for the development of weights assigned to each indicator. Thus, "the indicator weights...reflect the ability of each

indicator, when combined with other indicators, to predict the overall nursing care requirements or category of each patient" (MSC, 1993, p. 37). Relative workload values are assigned to each category to convert patient classification information into a measure of nursing workload. Validity of the classification instrument was re-established in 1993. Reliability is maintained through interrater reliability checks in each organization using the system.

The Medicus PCS provides information in the form of various reports. Reports are printed on a shift by shift, daily, biweekly, and year-to-date basis. Information for individual nursing units, groups of units and the organization is generated to assist in decision making and evaluation.

Recommended and Reported Uses of PCSs

Numerous uses for information generated by PCSs have been reported in the literature. While the earliest publications regarding patient classification appeared in the 1950s (Claussen, 1955), relatively few articles on the topic were published until the early 1970s. These early publications focused almost exclusively on the need to allocate nursing staff based upon patient care needs. The use of a PCS information for decision making regarding daily staffing, assignment of pool personnel, and establishing staffing patterns are identified as the reasons for developing and implementing a PCS (Claussen, 1955; Connor,

1960; Connor et al., 1961; Feyerherm, 1966; Georgette, 1970; McCartney, McKee, & Cady, 1970; Pardee, 1968). In addition to the use of PCSs for staffing purposes, one article mentions the potential use of this information for patient billing (Poland, English, Thornton, & Owens, 1970), while two suggest the use of PCSs to determine placement of patients (Connor et al., 1961; Poland et al., 1970). The use of PCSs is advocated because of a changed view of nurse staffing. That is, patient care needs are variable, and nurse staffing cannot be determined solely by the number of patients. With this underlying assumption, the authors suggested that PCSs are necessary for efficient management.

From 1971-1980, the growing interest in PCSs was reflected by an increased number of articles related to the topic. The majority of these articles described the development and implementation of PCSs and discussed the potential uses of information generated from these systems. The use of PCSs for staffing purposes remained a common emphasis (Clark & Diggs, 1971; Cochran, 1979; Des Ormeaux, 1977; Giovannetti, 1978, 1979; McPhail, 1975; Nield, 1975; Roehrl, 1979; Tilquin, 1977). In addition, budgeting (Des Ormeaux, 1977; Giovannetti, 1979; McPhail, 1975; Nield, 1975; Overton, Harrison, & Stinson, 1977; Youell, 1979), long range planning (Cochran, 1979; Overton et al., 1977; Williams, 1977), determining reimbursement rates, charging for nursing service (Clark & Diggs, 1971; Cochran, 1979;

Giovannetti, 1978; Williams, 1977), and planning nursing assignments (Giovannetti, 1978; Youell, 1979) received significant attention. Other possible uses for PCSs included: determining the level and mix of personnel (Des Ormeaux, 1977); allocating equipment and supplies (Giovannetti, 1978); and determining placement of patients (Giovannetti, 1978). The use of information generated by PCSs for evaluating quality of care (Harman, 1977) and productivity (Cochran, 1979) was recommended. The first mention of using patient classification information to evaluate nurse manager effectiveness (Youell, 1979) occurred during this time period. In addition, the use of patient classification information in nursing research was identified by a few authors (Cochran, 1979; Giovannetti, 1978; Harman, 1977). Actual research in the area of patient classification focused on the development of patient classification instruments and systems.

The value of PCSs for decision making was emphasized frequently. Tilquin (1977) and Youell (1979) stated that PCSs augment professional judgement by providing information to be used in decision making. Giovannetti (1979) described PCSs as essential tools to be used for the effective allocation and utilization of nursing resources. Other advocates suggested that objective determination of nursing personnel requirements is essential since nurses "constitute a major portion of a hospital's payroll expenditure"

(Trivedi, 1979, p. 109).

The volume of publications regarding PCSs increased tenfold during the 1980s. Many articles continued to report selection, development, implementation, evaluation and revision of PCSs (Adams & Duchane, 1985; Albrecht & Lieske, 1985; Auger & Dee, 1983; Berg, 1984; Birdsall, 1984; Boyer, Corbett, & Janson, 1986; Cisarik, 1983; Dee & Auger, 1983; DeGroot, 1989a, 1989b; de Leon, Williams, & Neff, 1984; Donaho & Haas, 1984; Gallagher, 1987; Gebhardt, 1982,; Grady, 1985; Heyrman & Nelson, 1986; Hoffman, Schaefer, & Zuraikal, 1986; Hylton, Johnson, & Moran, 1986; Jennings, Rea, Antopol, & Carty, 1989; Johnson, 1984; Ledford & Mikuleky, 1985; McNeal, Hutelmyer, & Abrami, 1987; Meyer & Sunquist, 1986; Mowry & Korpman, 1987; Overfelt & Ballash, 1983; Rabold, Rohlf, & Stead, 1987; Schroeder, Rhodes, & Shields, 1984; Schwartz, 1983; Serote, 1984; Unger, 1985; Williams, 1988). In addition, previously identified uses of information generated by PCSs continued to receive significant attention (Adams & Duchane, 1985; Alward, 1983; Ames & Madsen, 1981; Boyer et al., 1986; Burger & Schmitt, 1982; Cleland, 1982; Cleland, Martz, & Killeen, 1985; Curtin, 1985; Dale & Mable, 1983; Deines, 1983; Diggs, 1985, 1986; Duraiswamy, Welton, & Reisman, 1981; Ebener, 1985; Fawcett, 1985; Finkler, 1985; Gebhardt, 1982; Halloran, Patterson, & Kiley, 1987; Herzog, 1985a; Heyrman & Nelson, 1986; Jenkins, 1988; Johnson, 1984; Kachhal, DeBlaise-Dietz,

& Morris, 1986; Kirk & Dunaye, 1986; Ledwitch, 1988; McAlindon et al., 1986; Meijers, 1982, 1983; Meyer, 1984; Philibert, 1986; Piper, 1983, 1989; Powers, 1984; Reinert & Grant, 1981; Rielly, 1986; Ruman & Nelson, 1987; Saba, 1988; Saba & McCormick, 1986; Salmen, Hagen, & Patacky, 1986; Serote, 1984; Smith, 1989; Stuerke, 1984; Thibault, 1984; Tomsky, 1983; Torrez, 1983; Unger, 1985; Walker, 1983; Wilson, 1989).

Research using information generated from PCSs increased dramatically (Adams & Johnson, 1986; Atwood, Hinshaw, & Chance, 1986; Bell & Storey, 1984; Buck, 1986; Carter et al., 1987; Cheatwood & Martin, 1986; Cromwell & Price, 1988; Cullen, Keene, Waternaux, & Peterson, 1984; Fosbinder, 1986; Giovannetti, 1985; Grohar, Myers, & McSweeney, 1986; Halloran, 1985; Halloran, Kiley, & England, 1988; Harrell, 1986; Helt & Jelinek, 1988; Lucke & Lucke, 1986; McKibbin, Brimmer, Galliher, Hartley, & Clinton, 1985; Mion, McLaren, & Frengley, 1988; Mitchell, Miller, Welches, & Walker, 1984; Mowrey & Korpman, 1985; Prescott, 1986; Presgrove, 1985; Richards, Hexum, & Anderson, 1987; Rieder & Kay, 1985; Rosenbaum, Willert, Kelly, Grey, & McDonald, 1988; Sovie, Tarcinale, Vanputte, & Stunden, 1985; Thompson & Diers, 1988; Trofino, 1986, 1989; Wolf, Lesic, & Leak, 1986). However, research focusing on PCSs did not markedly increase. With the exception of two studies (Krause, 1988; Nagaprasanna, 1988), PCS research focuses on planning,

implementation and evaluation of the systems (Frink, Feetham, & Hougart, 1988; Huckabay & Skonieczny, 1981; Kelly & Montgomery, 1982; Kinley & Cronenwett, 1987; Misener, Frelin, & Twist, 1987; Reitz, 1985b; Whitney & Killien, 1987). Krause (1988) conducted the only study regarding actual use of information generated by a PCS. This study will be discussed in another section of this paper.

Significant interest in the use of PCSs for financial management purposes was evidenced by the number of articles related to this topic. The use of PCS information to identify expenses, costs and revenues associated with nursing care of patients received considerable attention (Adams & Duchane, 1985; Berg, 1984; Bermas & Van Slyck, 1984; Curtin, 1984, 1986; de Leon et al., 1984; Dijkers & Paradise, 1986; Edwardson & Giovannetti, 1987; Ethridge, 1985; Fabray & Greenhalgh, 1984; Giovannetti, 1985; Halloran et al., 1987; Krause, 1988; Mason & Daugherty, 1984; McCloskey, 1989; Nyberg & Wolff, 1984; O'Connor, 1988; Piper, 1983; Prescott & Phillips, 1988; Rosenbaum et al., 1988; Ruman & Nelson, 1987; Serote, 1984; Shafer, Frauenthal, & Tower, 1987; Staley & Luciano, 1984; St. Germain & Meijers, 1984; Trofino, 1985; Unger, 1985; Van Slyck, 1982; Walker, 1983). Similar emphasis was placed on identifying nursing hours and nursing costs per DRG (Adams & Duchene, 1985; Adams & Johnson, 1986; Bermas & Van Slyck, 1984; Buck, 1986; Caterinicchio & Turek, 1985; Cheatwood &

Martin, 1986; Curtin, 1983; Dijkers, Paradise, & Maxwell, 1986; Donaho & Haas, 1984; Edwardson, 1985; Fosbinder, 1986; Halloran et al., 1987; Hamilton, 1984; Herzog, 1985b; Jennings et al., 1989; Jones, 1984; Lagona & Stritzel, 1984; Marks, 1987; McClain & Selhat, 1984; Mowrey & Korpman, 1985; Nyberg & Wolff, 1984; O'Connor, 1988; Piper, 1983; Prescott, 1986; Serote, 1984; Trofino, 1989; Vanputte, Sovie, Tarcinale, & Stunden, 1985; Wilson, 1988). Establishing differential patient charges based upon information from PCSs was also advocated (Alward, 1983; Ames & Madsen, 1981; Atwood et al., 1986; Auger & Dee, 1983; Cisarik, 1983; Clark & Bellfy, 1983; Culpepper, 1984; Curtin, 1985; Edwardson, 1985; Piper, 1989; Reitz, 1985a; Study Group on Nursing Information Systems, 1983; Trofino, 1986; Vanderzee & Glusko, 1984; Vanputte et al., 1985; Van Slyck, 1982; Vaughan & MacLeod, 1985; Walker, 1983; Ward, 1984). This use was closely linked to the use of patient classification information as a basis for negotiating reimbursement from 3rd party payors (Ames & Madsen, 1981; Curtin, 1986; Halloran et al., 1987; Trofino, 1985). In addition, containing costs and expense reduction (Fabray & Greenhalgh, 1984; Grady, 1985; Herzog, 1985b; Huckabay & Skonieczny, 1981; Jenkins, 1983; Reinert & Grant, 1981; Tomsky, 1983), differentiating between essential nursing services and those that could be cut (Auger & Dee, 1983), determining which positions to fill or leave unfilled (Alward, 1983; Salmen et

al., 1986), making discharge planning decisions (Grady, 1985), and tracking performance against goals (Fishman, 1983) were also identified as financial management decisions that would be facilitated by the use of PCS information.

A few additional reasons to use patient classification information were discussed in the literature of the 1980s. These uses include: meeting accreditation requirements (Albrecht & Lieske, 1985; Boyd, 1983; Buck, 1986; Haas, 1988; Hartley & McKibbin, 1983; Huckabay & Skonieczny, 1981; Kirk & Dunaye, 1986; Ledford & Mikuleky, 1985; Piper, 1983; Porter-O'Grady, 1985), identifying "wards under pressure" (Fawcett, 1985), providing opportunities for data comparison among hospitals (Donaho & Haas, 1984; Herzog, 1985b; St. Germain & Meijers, 1984; Vaughan & MacLeod, 1985), and developing a database that can be used for nursing and administrative decision making (Donaho & Haas, 1984; Fishman, 1983; Shafer & Kusmin, 1983).

The literature from this decade reflects the increased emphasis on the responsibility and involvement of nurses in daily as well as strategic management of resources. The use of PCSs as a tool to enable administrators to use valuable resources wisely was consistently advocated (Dale & Mable, 1983; Meijers, 1982; Piper, 1989; Reinert & Grant, 1981). McHugh (1986) states, "In a highly competitive and rapidly changing environment, the information required to support the manager's knowledge base is not a luxury. It is an

essential commodity" (p. 11). In addition, PCSs were considered essential for communication of nursing value in measurable and financial terms that are understood by others (Culpepper, 1984; Duraiswamy et al., 1981; Edwardson, 1985; Porter-O'Grady, 1985; Van Slyck, 1982). The importance of rational decision making based on data versus the use of intuition was emphasized in numerous articles (Curtin, 1984; Hamilton, 1984; Powers, 1984, Torrez, 1983).

The 1990s literature reflects continued interest in PCSs. While a number of articles presented content similar to previous publications, many reflected the development of more sophisticated systems or applications than described in the 1980s (Adams, 1995; Balogh, 1992; DeGroot, 1994a, 1994b; Farnham, Maez-Rauzi, & Conway, 1992; Finkler, 1991; Finnigan, Abel, Dobler, Hudon, & Terry, 1993; Giovannetti & Johnson, 1990; Joel, 1995; Johns, 1993; Karshmer, 1991; Kirsch & Talbott, 1990; Mahrenholz, 1990; Meyer & James, 1990; Monroe, Grau, Wright, Crenshaw, & Nagey, 1991; Noyes, 1994; Nygaard & Hansen, 1991; Roland & Roland, 1992; Silva & Aderholdt, 1992; Van Der Walt, 1992; Van Slyck, 1991a, 1991b, 1991c, 1991d; Wrona-Sexton, 1992). In addition, a number of articles described the modification or development of PCSs for use in specialty areas such as intensive care units, hemodialysis units, emergency departments, rehabilitation settings and home health (Barnes et al., 1991; Birdsall, 1991; Cottey, Nauert, & Wells, 1992; Dunbar

& Diehl, 1995; Farnham et al., 1992; Godin, 1995; Hayes, 1991; Hays, 1992; Italian Multicenter Group of ICU Research, 1991; Kirsch & Talbott, 1990; Lovett, Reardon, Gordon, & McMillan, 1994; MacNaughton, 1995; Molter, 1990; Nygaard & Hansen, 1991). The focus on more sophisticated PCSs and integrated nursing information systems is reflected throughout the literature of this decade. This is related to the recognition that the reality of health care today is more complex than when the first PCSs were developed. Linking nursing resource use with cost and outcome is considered essential (Adams, 1995; Finnigan, 1993; Finnegan et al., 1993; Levenstam & Engberg, 1993). Thus, evaluating and redefining the purpose of PCSs is advocated (Lawson, Formella, Smeltzer, & Walters, 1993).

In addition to the literature describing refinements to existing systems or more sophisticated means to utilize information for previously described purposes, three additional uses for information generated by PCSs were identified. Monroe et al. (1991) suggest using the information for an incentive program based on productivity; Bostrom (1992) advocates using information obtained in the first 24 hours of hospitalization as a basis for identifying severity of illness and developing a model to predict nursing resource requirements for individual patients; and, Giovannetti and Johnson (1990) recommend using patient classification information for negotiating contracts with

Health Maintenance Organizations.

Information generated by PCSs continues to be used in research (Bostrom, 1992; Bostrom & Mitchell, 1991; Sherman & Jones, 1995; Van Hoesen & Eriksen, 1990; Van Ruiswyk et al., 1992). In fact, Eckhart (1993) reviewed 73 primary research studies on costing out nursing services and identified that majority of work in this area has been based upon information generated by PCSs.

Additional research focusing on PCSs has also been published. Many studies focus on development (Buckle et al., 1991; Molter, 1990; Prescott, 1991; Prescott et al., 1991; Soeken & Prescott; 1991) and evaluation of PCSs (Batty, Mooney, & Lowry, 1990; Bigbee et al., 1992; Lovett et al., 1994; Marsee, Lovett, & McMillan, 1995; Prescott et al., 1991; Soeken & Prescott, 1991). In addition, studies by Cockerill, Pallas, Bolley, and Pink (1993), O'Brien-Pallas, Cockerill, and Leatt (1992), and Phillips, Castorr, Prescott, and Soeken (1992) compared nursing hours of care estimates from different PCSs.

The number of hospitals using PCSs was reported in two studies. The findings from a survey of 300 senior nurse executives in Canada (Cockerill & O'Brien-Pallas, 1990; O'Brien-Pallas & Cockerill, 1990) indicated that over 50% of the hospitals had a PCS in place. Medicus was one of the most commonly used systems. Wake (1990) surveyed chief nurse executives in the United States regarding nursing care

delivery system elements used in their respective hospitals. Nine hundred eighteen (918) chief nurse executives responded to the questions regarding PCSs. Ninety six percent (96%) of the respondents indicated the use of a PCS, and 69% of the hospitals used commercially developed systems. The Medicus system was one of the two most commonly used commercially developed systems.

The patient classification literature of the 1990s reflects the administrative focus on managing costs in the current health care environment (Bigbee et al., 1992; DeGroot, 1994a; Kelleher, 1992; Prescott et al., 1991; Sherman & Jones, 1995). The continued use and development of increasingly sophisticated PCSs is advocated as a way to improve the precision of nursing resource utilization and to control organizational costs. For example, Finnegan, et al. (1993) indicate that integration with other electronic information systems is essential for linking patient outcomes, cost of care, and quality measurements. There is recognition that PCSs need to be continually evaluated and refined for optimum use in decision making (Adams, 1995; DeGroot, 1994a; Finnigan et al., 1993; Noyes, 1994). In addition, while mentioned in the 1980s literature, development of a universal classification system or standardization of nursing acuity systems has recently been addressed more directly (Buckle et al., 1991; Eckhart, 1993; Kelleher, 1992; O'Brien-Pallas et al., 1992). Similarly,

Cockerill et al. (1993) suggest development of relational statements between established PCSs as an interim step to allow data pooling and comparison between organizations.

Underuse of PCS Information

The majority of publications regarding PCSs advocate and describe their potential uses. However, a number of articles mention factors considered to inhibit the actual use of patient classification information. Particular attention has been paid to the importance of the validity, reliability and credibility of patient classification instruments. Validity and reliability are frequently addressed in the literature. The majority of articles regarding PCSs identify the need for the tools to accurately measure the nursing care requirements of patients. Consistency of patient classification generated nursing workload estimates within and between organizations is also frequently addressed. Thus, validity and reliability of patient classification tools and systems are considered to be imperative and are purported to influence use of the information generated (DeGroot, 1994a; Finnigan, 1994; Groves, 1994; Strickland & Neely, 1995). However, DeGroot (1994a) notes that there are few data regarding the validity of PCSs. Assessment of reliability is frequently lacking as well. The dearth of well tested, valid, and reliable measures is considered to negatively effect the use of information generated by PCSs.

Giovannetti and Mayer (1984) relate lack of acceptance, confidence, and understanding of PCSs to lack of use. There is agreement that the information must be convincing to all users. However, this is too often not the case (Finnigan, 1994). Frequently noted is the fact that nurses lose faith in an instrument which often produces results perceived to contradict professional judgement (Alward, 1983; Ballard, Gray, Knauf, & Uppal, 1993; Chagnon, Audette, & Tilquin, 1977; Curtin, 1984, 1986; Ebener, 1985; Edwardson, 1985; Giovannetti, 1985; Giovannetti & Mayer, 1984; Lawson et al., 1993; Noyes, 1994; Prescott, 1986; Salmen et al., 1986; Serote, 1984; Sovie et al., 1985; Staley & Luciano, 1984; Tilquin, 1977; Vanderzee & Glusko, 1984). Additionally, nurses are skeptical about the quality of the information. Nurses know that classification tools may not be consistently or accurately completed (Finnigan, 1994; Martorella, 1996; Strickland & Neely, 1995; Van Slyck, 1991a). Van Slyck's (1991a) statement, "data are not used in any practical way because they are not believed" (p. 16) sums up the major concerns related to validity, reliability and credibility.

Other factors influencing the use of PCS information were related to the system, the information, and the users. System factors included system accessibility and ease of use (Diggs, 1986; Porter-O'Grady, 1985), as well as the time involved to use the system (Finnigan, 1993; Ganti & Young,

1983; Lawson et al., 1993; Monroe et al., 1991). In addition to validity, reliability and credibility, perceived relevance of the information was considered important (Finnigan et al., 1993). Nurses frequently do not see a link between the use of PCS information and improved patient care (Taylor & Hagey, 1995). User related factors included the expertise of the nurse administrator (DeGroot, 1989b), and the education provided to all hospital personnel, including the executive director and finance officers, regarding the PCS (Ames & Madsen, 1981; Meijers, 1982). Taylor and Hagey (1995) suggest that lack of specific information provided to nurses about the calculations used to determine staffing requirements creates skepticism about "voodoo staffing" (p. 82). The ability to implement recommended staffing (Finnigan, 1993; Finnigan et al., 1993; Huckabay & Skonieczny, 1981) and the effect of information use on quality (Serote, 1984) were also identified as factors related to the use of PCS information. A different view was presented by Strickland and Neely (1995). They suggest that a PCS operating for a number of years may result in daily rituals rather than use of information in decision making.

Research: Nursing Informatics and Decision Making

There is a wealth of information regarding the potential uses of information technology for managerial decision making in nursing. However, no published studies have examined the actual use of nursing informatics in

decision making. In fact, only one has study examined the use of information generated by a nursing information system. Krause (1988) studied the use of information generated by manual and automated PCSs. Unfortunately, comparisons in information use between automated and manual systems were not made.

Krause (1988) conducted a study to determine the uses of PCS information by nursing departments in acute care hospitals located in eastern Wisconsin. Data were collected by means of a questionnaire mailed to a convenience sample of nurse administrators from 61 acute care hospitals in eastern Wisconsin.

The instrument was a self-administered questionnaire designed specifically for the study as there was no existing instrument that elicited data related to uses of PCS information. The 57 questions were derived from a review of the nursing and management literature describing types of PCSs and uses of PCS information. The questionnaire was reviewed by a panel of experts to establish face validity. Fifty-two percent of the questionnaires were returned.

Analysis of the questionnaires revealed that the most common use of PCS information was to assist the nursing department with staffing decisions. The majority of respondents indicated interest, though little actual use, in using the information for the development of nursing personnel budgets and costing out nursing services. Only a

few nurse administrators reported that they had used PCS information to develop their budget. Other identified uses for PCS information were: to track nursing acuity levels by DRG, to document and validate acuity levels, to promote staff awareness of patient's acuity, and to provide a data source for comparison with other hospitals using the same PCSs.

Analysis revealed that PCS information was more extensively used when the system was considered reliable and valid. On the whole, respondents indicated their system was reliable and valid, but did not think that the staff nurses were as convinced as they were. Seventy-nine percent of the respondents did not believe the finance administrator in their institution considered the PCS reliable and valid.

The author (Krause, 1988) recommended revision of the instrument prior to repeating the study. In addition, she suggested inclusion of staff nurses and hospital administrators to gain insight into their understanding and confidence in the PCS. Krause concluded by recommending further research on the actual uses of PCS information by individual nursing departments, the nursing community as a whole and by other members of the hospital team.

In addition to the limitations identified by Krause (1988), the knowledge, roles, and perspectives of individual respondents were not addressed in this study. The survey was sent to nurse administrators and could have been completed

by that individual or delegated to another in the nursing service organization. Knowing who in the organization completed the survey is critical to understanding how the results of the study can be viewed. Furthermore, subjects might have completed the survey based upon the intended uses rather than actual uses of the information in their facility. Additionally, Krause's research did not specifically focus on the use of information sources in addition to, or instead of, PCS generated information. Inattention to the influence of the context on decision making was another limitation of Krause's study.

The Actual Use of Information Generated by a PCS

The potential uses of PCS information have been described extensively in the literature, however, there is only one study that attempts to identify how the information is actually used (Krause, 1988). While this study adds to our knowledge regarding the reported use of information generated by PCSs in eastern Wisconsin, there is still much that is unknown. In particular, how and to what extent the information is actually used by various levels of hospital personnel is not known. No studies were found that examined why PCS information is used as the basis for some decisions and not others.

The patient classification literature assumes a rational approach to decision making. Thus, the premise underlying the majority of the articles regarding patient

classification is that if the information generated is valid and reliable, and is transformed in a timely manner into information that is relevant for the decision maker, then it will be used to make "the most rational decisions possible to allocate scarce resources in the most efficient way possible" (Schmitz, 1989, p.17). While this perspective has some merit, some literature on organizational decision making refutes this view. For example, the bounded rationality, political, contingency, anarchic, cultural, and rule following models assume that there is not a linear, rational relationship between information and decisions. Each of these alternative perspectives is valuable for understanding decision making in organizations, however each perspective alone limits understanding the phenomenon of information use in organizational decision making.

This study regarding informatics and decision making was designed using the premise that many factors may affect decision making. Thus, the varied use of PCS information in decision making by different groups of individuals and for different decisions was considered a possibility. A case study approach provided the researcher with the opportunity to explore and describe the actual use of information generated by an automated PCS in hospital decision making. The findings from this study contribute to existing knowledge and theory regarding the use of information in organizational decision making. In addition, the study

identified how information generated from a PCS is actually used in hospital decision making and provides a foundation for further research.

# CHAPTER 3

## METHODOLOGY

The case study method is "the preferred strategy when 'how' or 'why' questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context" (Yin, 1984, p. 13). Case studies make a unique contribution to knowledge of complex individual, organizational, social and political phenomena by allowing an investigation to retain the holistic and meaningful characteristics of real-life events. The strength of this approach is the ability to deal with a variety of evidence such as documents, interviews and observations (Hutchinson, 1990; Yin, 1984). The complexity of health care organizations and decision processes, as well as the lack of previous research regarding the use of patient classification information in decision making, provided a compelling reason to use the case study approach. Specifically, the case study approach described by Yin (1984; 1989) was used in this study.

As a descriptive approach, this method treats the single case as a "cluster of heterogeneous units of analysis" (McClintock, Brannon, & Maynard-Moody, 1979, p. 151). In this study, the case was an acute care hospital. In the context of this case, theoretically meaningful units of analysis were investigated. Units of analysis were comprised

of the types of decisions that are guided by PCS information, how this information is used in decisions, and why the information is used, or not used, by nursing department and other hospital personnel. Informants (nurse managers, nurse administrators, hospital administrators and support staff) were also considered units of analysis in this study.

The investigator sampled decisions by collecting and analyzing data regarding the opportunities for use and non-use of patient classification information identified by informants. For example, decision opportunities included but were not limited to: daily staffing (assignment of nursing personnel to nursing units and specific patients), scheduling (number and level of personnel regularly scheduled per unit per shift), and budgeting (personnel levels, distribution and number of FTEs). Additional types of decisions, such as costing out nursing services, emerged during data collection.

## Setting

This case study was conducted in an acute care, university teaching hospital of approximately 500 beds (Anonymous, personal communication, May 25, 1995). The medical center is located in a small urban area and serves a seven county region in one of the Middle Atlantic States in the United States of America. An acute care hospital setting was selected because the majority of nursing information

systems, including automated PCSs, have been developed for use in this type of organization.

This hospital had utilized the Medicus PCS since 1988 (Anonymous, personal communication, June 5, 1995). Use of the Medicus System was one of the criteria for selection of the site for this case study because the Medicus system is one of the major patient classification systems currently utilized in the United States, with over 400 users nationwide (A. Verona, personal communication, August 1994). In addition, the Medicus System enjoys a reputation of being based upon a valid and reliable instrument for patient classification (MSC, 1994). A setting utilizing the Medicus system was selected because the investigator is familiar with the system. She has expertise working with the Medicus PCS; she used it for six years as a nurse administrator and consultant. This allowed her focus to be on data collection and analysis rather than on gaining an understanding of the system. The issue of potential bias related to the investigator's knowledge of Medicus is addressed in a later section of this chapter.

Selection of a hospital which had used the Medicus system for seven years allowed ample time for hospital personnel to understand the system. In addition, this time period was sufficient so that hospital personnel had the opportunity to make decisions based upon Medicus patient classification information and create a paper trail

providing evidence of this process.

## Informants

Data were accessed through interviews and direct observations of hospital personnel. Informants included first line nurse managers (staff nurses, clinical head nurses, attending nurses); middle level nurse managers (assistant nurse managers, nurse managers, house supervisors); upper level nurse administrators (division directors, nurse executive); other hospital administrators (Chief Financial Officer, Chief Operating Officer, Chief Executive Officer); and support staff (clinical nurse specialists, nurse educators, Medicus support staff).

## Sources of Data

Multiple sources of data were used. The various sources of data encouraged convergent lines of inquiry, a process of triangulation (Hutchinson, 1990; Yin, 1989). Data were collected from the following sources: hospital personnel; observations of shift to shift report and other situations when decisions were being made for resource allocation; physical artifacts (e.g., Medicus computer printouts); archival records (e.g., daily staffing sheets, organizational charts, nursing unit budgets, nursing unit assignment sheets, etc.); and documents (e.g., letters, memos, meeting minutes, etc.). See Appendix A.

## Methods of Data Collection

Following permission to conduct the study, the

investigator began interviewing informants from hospital administration as well as the nursing department. Informants were identified following an initial interview with the nurse executive (Appendix B). Purposive sampling included informants from all categories of personnel. Interviews were audiotape recorded and transcribed verbatim by a transcriptionist. The questions asked during the initial semi-structured interviews consisted of a core of questions utilized for all informants. Demographic information was obtained at the beginning of the interview (Appendix C), and was followed by open-ended questions regarding PCSs and decision making (Appendix D). Prompts were used to facilitate the thought processes of the informants regarding specific aspects of their use of PCS information in decision making (McCracken, 1988).

Questions for the semi-structured interview were developed after reviewing the literature regarding patient classification and organizational decision making. However, use of these pre-determined questions did not preempt the open-ended nature of the interviews (McCracken, 1988). For example, additional questions were stimulated by the responses of the informants during the interviews.

Theoretical sampling was guided by analysis of the data obtained from the initial interviews and throughout the interview process. Thus, subsequent interviews were conducted for one of two purposes; to gain further

information or for corroboration (Yin, 1989). The number of additional interviews needed was determined during the progression of the study. A total of 67 informants were formally interviewed. Two informants were formally interviewed twice, and one was formally interviewed three times. Informal follow-up discussions were held with 10 informants.

Observation

Direct observations of hospital staff were made during rounds, shift-to-shift report, and other situations. Overt participation as an outside researcher was the role assumed by this investigator during these observational episodes (Jorgensen, 1989). Identification and selection of observational situations took place after entry into the field. The length of time involved for each of these observational episodes varied. For example, shift to shift reports extended from 20 to 50 minutes, while other observations took from 2 minutes to 30 minutes. Opportunities for decision observations included interactions between house managers and staff nurses during rounds, and discussions between staff nurses regarding the assignment of patients. These planned observations were made at various times of day and were guided by the practices in the organization. Field notes were taken by hand during planned observations. Immediately after these observations, the field notes were fully expanded and typed on to a

computer disk in the field.

In addition, data were collected by means of informal observations and listening to conversations related to the use of Medicus information. Field notes were recorded on a laptop personal computer immediately following such observational episodes. All field notes were dated and timed with the location of the observation also recorded. Informants were identified by pseudonyms.

Documents, Physical Artifacts and Archival Records

Documents such as letters, memos and minutes, (see Appendix A), were analyzed for types of decisions made and whether Medicus PCS information was used in making these decisions. Notes included a description of the document, the type of decision(s) indicated and whether information generated from the Medicus system was, or could have been used in the decision making process. Judgement was used to identify information that was not, but could have been, used in the decision making process. Thus, notes include the rationale for the investigator's judgement. In addition, the pseudonym and job title of the individual(s) involved in the decision process were noted, as were individuals who could potentially answer further questions regarding the document and decision process. Also noted was evidence contained in the documents regarding the reason why PCS generated information was or was not used in decision making.

Additionally, computer printouts generated by the

automated Medicus PCS were examined. Notes included a description of the printout, the unit(s) or area(s) referred to on the printout, and the types of decisions suggested or reflected by the information. Specific details regarding the potential types of decisions suggested by the Medicus information, as well as evidence reflecting the actual use of Medicus information in decision making were included in the notes.

Archival records such as patient assignment sheets, staffing sheets, and budgets were also analyzed in conjunction with the above documents to determine whether PCS information had been used in decision making. Notes included a description of the type of record, the type of decisions possible, and whether information generated from the Medicus system could have been, or actually was, used in the decision making process. Additional documents, computer printouts and archival records were identified and analyzed throughout the study.

Initial interviews and examination of documents stimulated additional questions in subsequent interviews. Follow up interviews with three clinical division directors were conducted to obtain further information and clarification in regard to the documents, computer printouts and archival records. These interviews were audiotape recorded and transcribed verbatim.

## Time Frame

Data were collected for a period of 21 months; from July 1995 through March 1997. The majority of interviews, observations and on-site document analysis activities were be conducted between 7 a.m. and 12 midnight. However, due to the nature of decision making regarding staffing and patient care management, data collection occurred on two night shifts. For the same reason, data were collected throughout the week, including weekdays, weekends and holidays. A daily schedule reflecting specific plans and activities of the researcher in the field was recorded on computer diskette.

## Data Management

A case study data base was developed during the course of the study. This data base includes case study notes and documents. These were organized to provide for a formal, retrievable data base (Yin, 1989).

Case study notes, including interviews, field observations, document analyses, and reflexive journals were maintained on audiotapes and/or computer diskettes. Once transcribed, audiotapes were filed by date and interview number. Each diskette contained only one type of note: interview, observation, document analysis, or journal. Interview diskettes were organized by files labeled according to the type of informant and interview number. Diskettes containing notes regarding observations were organized by date and time of observation. For each date, a timed list indicating the general focus of each observation

was developed for use as an index. Documents or document notes were organized by the name of the document as well as the date the document was obtained. Reflexive journal entries were arranged in chronological order, and labeled with the date of the entry. Original data (audiotapes, diskettes, and hardcopies) were stored in locked files accessible only to the researcher. Backup copies were made of all computer diskettes and were stored in a different locked file and building than the original data.

An annotated bibliography of the documents collected during the case study was developed and maintained on a computer diskette. In addition, a hard copy of the bibliography was kept in the front of the file box containing the actual documents. Documents were filed by type and organized in chronological order by date. Case study notes referring to specific documents included the type of document as well as other necessary information for cross-referencing purposes.

In addition to the raw data files, data analysis files and analytic memo files were maintained on computer diskettes. Daily schedules and logistics of the study, personal notes reflecting personal responses and introspection regarding what was happening in the field, and methodologic notes in which methodological decision making processes are reflected (Lincoln & Guba, 1985) were recorded on computer diskettes.

## Data Analysis

A constant comparative method of data analysis (Lincoln & Guba, 1985) was used to analyze the data. Due to the distance between the investigator's home and the data collection site, the data were collected and analyzed in eight waves. After each wave of data collection, data were analyzed. This approach met the criteria for simultaneous data collection and data analysis (Y. Lincoln, personal communication, March 16, 1996). Theoretically relevant categories were thus induced through a systematic approach.

The four components of the data analysis process included unitizing, categorizing, filling in patterns, and member checks (Lincoln & Guba, 1985). Unitizing involves the "identification of units of information that will, sooner or later, serve as the basis for defining categories" (Lincoln & Guba, 1985, p. 344). Each identified segment of text, or unit of information, is aimed at some understanding necessary for the researcher, and contains the smallest amount of information that can be interpreted in the absence of additional information (Erlandson, Harris, Skipper, & Allen, 1993; Lincoln & Guba, 1985). The evidence collected from semi-structured interviews, direct observations, and documents was examined line by line. As units of information were identified, they were identified with codes indicating the source (interview, observation, document), informant type (first line nurse manager, middle level nurse manager,

upper level nurse manager, hospital administrator, other), and the data collection episode (date and time when data were collected) as recommended by Lincoln and Guba (1985), Miles and Huberman (1984, 1994), and Yin (1989). A computer was used to record the codes during the unitizing process. This system allowed for ease of retrieval and further analysis (Erlandson et al., 1993).

Interpretive labels emerged progressively during data analysis and were identified during the categorizing operation of data processing (Lincoln & Guba, 1985; Miles & Huberman, 1984, 1994). Interpretive labels identify an emergent theme, pattern or explanation, and serve to group segments of data into categories. Thus, the units of information identified during the unitizing phase of data processing that seemed to relate to the same content were provisionally categorized and given an interpretive category label. Rules that described category properties were devised during this stage of data analysis, and served to justify the inclusion of each of the units of information. The descriptions of category properties assisted in the identification of categories that were internally consistent (Lincoln & Guba, 1985). The process of constant comparison outlined by Lincoln and Guba was utilized with modifications for use with computerized files rather than index cards.

Filling in the patterns was accomplished by reviewing the categories. Categories were defined so they were

internally homogeneous and externally as heterogenous as possible. Internal homogeneity refers to the extent to which data in the category fit together in a meaningful way, and external heterogeneity reflects the extent to which differences in categories are distinct (Lincoln & Guba, 1985; Patton, 1990). Constant comparison between the individual units of data and the categories was used to verify the internal homogeneity and external heterogeneity of the categories. Overlapping categories, or categories that were incomplete or appeared to be missing were earmarked for follow-up. These categories were pursued in subsequent data collection efforts for the purpose of filling in patterns.

Analytic memos were written throughout data collection and analysis. These memos were conceptual in nature and served as a means for theorizing about relationships. The purpose of analytic memos is to capture ideas and thought processes regarding the placement of data in a conceptual frame. This process facilitated the induction of propositional statements regarding information use in decision making.

During the continuous data collection and data processing sequence, member checks were conducted. Transcriptions of five interviews conducted during the first wave of data collection were taken back to the respondents for their examination. The researcher did not receive any

substantive corrections or additional information from any of the informants. Each informant indicated the transcript accurately reflected his/her interview. Later in the data analysis process, categories were taken back to key informants from each managerial level for their examination and reaction. This provided an opportunity to determine credibility of the categories (Lincoln & Guba, 1985). In addition, member checks were used as the case study report was being prepared (Guba & Lincoln, 1989). For example, two informants read Chapters 4 and 5 of this dissertation. Both were asked to identify anything they felt did not accurately portray the use of Medicus information in the hospital. One made two technical corrections that related to the setting. Neither informant identified anything that was inconsistent with the use of Medicus information in the organization.

Data collection and analysis continued until the four criteria outlined by Guba (1978) were met. These criteria include: exhaustion of sources, saturation of categories, emergence of regularities, and overextension. Closure took place when sources of data were exhausted, when categories were saturated so that new sources provided redundant data, when clear patterns regularly emerged, and when the analysis began to extend beyond the concerns guiding the research (Guba, 1978; Patton, 1990).

## Pre-Fieldwork

As a pre-fieldwork exercise, pilot interviews were

conducted with a first line nurse manager, a middle nurse manager, and an upper level nurse administrator. Based upon the responses, two questions were added to the semi-structured interview and some of the questions were slightly altered to improve clarity. In addition, this process facilitated the identification of useful prompts.

The unitizing phase of data processing was completed utilizing the data obtained from these interviews. As a result, the planned format for transcription was modified. The method of constant comparison was used to categorize the units of information, however category labels were not identified during the preliminary fieldwork. This work reinforced the need for a transcriptionist.

## Scientific Adequacy

Yin (1989) described a case study as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used" (p. 23). Case studies are generalizable to theoretical propositions, not to populations or universes. The goal of case study research is to expand and generalize theories (Yin, 1984).

Although quantitative and/or qualitative strategies may be used to collect and analyze data in case study research, a qualitative design was used exclusively in this study. Yin (1989) presents tactics to achieve scientific adequacy in

case studies, however Yin frames these tactics with terminology used predominantly in the quantitative paradigm. The case-study tactics Yin presents are similar and consistent with those presented by Lincoln and Guba (1985) in their discussion of rigor in naturalistic inquiry. Thus, the criteria described by Lincoln and Guba were used for the purpose of establishing the scientific adequacy of this case study.

Lincoln and Guba (1985) outline four trustworthiness criteria: credibility, transferability, dependability and confirmability. Credibility refers to confidence in the truth of the data; transferability is the extent to which the findings may be transferred to other settings or groups; dependability refers to the stability of data over time and conditions; and, confirmability is the extent to which there would be agreement by others about the data's meaning (Lincoln & Guba, 1985; Polit & Hungler, 1995).

Credibility was achieved by using the strategies of triangulation and member checks. Triangulation across data sources and data collection procedures implies the use of multiple sources of evidence (first, middle and top level nurse managers as well as administrators and support staff) and methods of data collection (i.e. interview, observation, document analysis) to determine congruence of findings. Triangulation provides a basis for convergence on the truth. The use of member checks is the process by which key

informants review data, analytic categories, interpretations and conclusions of the case study. This strategy allowed the researcher to validate that the case study results adequately represent the informants' realities (Lincoln & Guba, 1985). Member checks occurred on an informal and formal basis throughout the investigation.

Transferability is not established by the investigator. However, a detailed description of the context of the study is essential for others to make decisions regarding the transferability of findings. Thick description was used to develop the case study report. A thorough description of the context in which the case study was conducted as well as the reported uses of Medicus information in decision processes are included in Chapter 4 (Lincoln & Guba, 1985). This provides others with the basis for evaluating the applicability of the data to other contexts.

To establish dependability, the use of a case study protocol outlining the procedures and general rules for the conduct of the study guided this investigation (Lincoln & Guba, 1985; Yin, 1989). Chapter 3 of the dissertation proposal, the essence of which is reflected in this chapter, served as the protocol. Additionally, maintaining an audit trail allows for clear cross referencing from the initial questions to the methodological procedures to the resulting evidence. This also allows confirmability to be established. For this study, the chain of evidence was audited by the

dissertation committee members. They read the initial research questions and the research protocol. In addition, they reviewed selected field notes, document notes, and thematic analyses of transcribed interviews; and followed the results and conclusions of the investigator in relation to the evidence.

## Investigator Bias

One of the pitfalls of the required interaction between the researcher and informants during the conduct of a qualitative case study is the potential influence of investigator bias (Hutchinson, 1986; Lincoln & Guba, 1985). Hutchinson (1986) suggested that the investigator explicitly identify his/her preconceptions, beliefs and values. These personal biases should be identified prior to, and during, data collection and analysis to sustain a heightened level of awareness.

This investigator has been a middle and upper level nurse administrator in community and university teaching hospitals. She has used the Medicus PCS in two settings, and has also been a consultant regarding use of this system. Based upon these administrative experiences, as well as her knowledge of current research findings, she holds two beliefs regarding the use of patient classification information in decision making. This investigator believes that information generated by PCSs can be useful in hospital decision making and that multiple factors influence decision

making.

Strauss (1987) stated that experiential data are essential, but control must be exerted over the researcher's biases. The researcher used a reflexive journal, allowing for reflection on her experiential knowledge, reactions, intuitions, biases, and ethical dilemmas. In addition, the strategies employed to establish trustworthiness provided a system of checks and balances (Lincoln & Guba, 1985).

## Protection of Human Subjects

The investigator obtained permission to conduct the study from the University of Pennsylvania's Human Subjects Review Committee (Appendix E). She gained access to the acute care setting by requesting permission to conduct the study from the chief nurse executive. Following agreement to participate in the investigation, the researcher submitted the proposal to the hospital's institutional review board for human subjects consideration (Appendix F). Informants, including all levels of nursing and administrative staff eligible to be interviewed, were requested to participate in the study and were asked to sign the consent form (Appendix G). Anonymity and confidentiality were provided for in several ways. Only pseudonyms were used for the hospital and the informants. A code book identifying real names and corresponding pseudonyms is locked in a secure file cabinet in the researcher's home. Audiotape recordings and original transcriptions of interviews are locked in a secure cabinet

in the researcher's home and will be destroyed at the conclusion of the research, which may include later secondary analysis. Identifying information was excluded from interview transcriptions used for analysis purposes.

## Writing the Report

Composition of the final report began during the analytic process. As various sections of the case study report were drafted they were reviewed by the informants as well as professional colleagues. Informants were asked to verify the accuracy of the data and provide corrections as necessary. This process enhanced the accuracy of the case study and provided the opportunity to obtain further evidence. Professional colleagues reviewed the case study report for clarity, as well as a display of evidence sufficient to support the analysis. Based upon the report, the reader should be able to reach an independent judgement regarding the merits of the findings (Yin, 1989). The object of both informant and peer review is to develop an interesting narrative that is credible to others (Lincoln & Guba, 1985).

An interpretive description of the use of PCS information in hospital decision making is the outcome of this study. In addition, an inductively developed set of propositional statements regarding information use in decision making is presented. A narrative reporting style is used for the presentation of the final descriptive analysis

of the case. The sequence of topics in the case study report is organized by chapter. Chapters 1, 2, and 3 include: an introduction of the problem studied, a review of the relevant literature, and the methodology used to conduct the study. Chapter 4 includes thorough descriptions of the case study setting and the use of patient classification information in decision making. The writing in this chapter is more informal than in the preceding chapters to allow for portrayal of the site from the informants' perspectives. Informants' language as well as significant detail is included in this chapter (Lincoln & Guba, 1985).

A discussion of the outcomes of the case study is presented in Chapter 5. The interpretation of the findings, including a presentation of an inductively developed set of propositional statements regarding information use in decision making is presented in this chapter. In addition, this chapter includes a comparison of the findings with existing theories of decision making and a presentation of implications resulting from this interpretation and comparison.

## Study Limitations

Several limitations of this study were identified. Perhaps the most significant limitation was the predominant use of informant interviews as a source of data. While the informants thoroughly described how and why patient classification information was used in decision making, few

opportunities existed to observe actual decision situations. The uses of Medicus information in this organization typically involved informal processes that took place over time. Additionally, individuals frequently used Medicus information in situations that were solitary and non-public in nature. The observed decision situations provided data that were congruent with data collected during informant interviews. However, the inability to observe decision situations involving all identified uses of patient classification information is a limitation of this study. Additionally, there were few documents reflecting decision processes that involved the use of patient classification information. One informant noted that "we just don't talk about Medicus that much in our meetings, so you won't find much about it in our minutes...or anywhere else for that matter". Physical artifacts and archival records reflecting the use of Medicus information in the organization were more plentiful. However, these sources provided limited data regarding the factors that influence use of patient classification information. The lack of documentary evidence available in this organization may also be considered a limitation of this study.

Limitations to the methodology used to conduct this research must also be considered. There are a number of common concerns regarding the use of a case study approach. For example, Yin (1989) and Guba and Lincoln (1989)

indicated that results may be biased because of lack of rigor in the collection and interpretation of data. This investigator attempted to strengthen the scientific rigor of this case study by using the methods advocated by Yin, and Guba and Lincoln. Specifically, this study was conducted using a case study protocol that incorporated the use of triangulation, member checks, thick description, and maintenance of an audit trail.

Another common criticism of case studies is that the findings are not generalizable. This criticism refers to statistical generalization. This is the more commonly recognized way of generalizing, where an inference is made about a population based upon the data collected from a sample. In contrast, analytic generalization occurs when the empirical results of a study are compared with existing theory (Yin, 1989). Findings from this organizational case study inform theory and thus may be considered generalizable at the theory level.

An additional limitation of a qualitative case study approach is the difficulty maintaining anonymity and confidentiality (Lincoln & Guba, 1985). This may result in political and ethical sensitivity during data collection and the presentation of findings. A number of informants asked specifically about access to the taped interviews. Due to this expressed concern, an additional precaution was implemented. All tapes were held in the lab coat pocket of

the investigator while on the hospital premises. Thus, tapes were never unattended by the investigator. This procedure was described to informants during the informed consent process. Informants were also verbally told that they could stop the interview at any time or choose not to answer specific questions. Only one informant declined to answer an interview question. The investigator addressed the issues of anonymity and confidentiality throughout the study as described in the protection of human subjects section of this chapter.

# CHAPTER 4

# RESULTS

The results of this organizational case study are presented using the research questions as a framework. Recognizing the importance of context, this section begins with a presentation of the contextual background of this study. A description of the study participants follows. Categories that emerged from the data are then presented in relation to each of the research questions.

## Contextual Background

The organization is a university medical center located in one of the middle atlantic states. The medical center serves a population of 1.5 million in a seven county region and has 504 inpatient beds. Additionally, it is known nationally and internationally for pioneering work in certain specialties. The facility is modern, with state of the art equipment.

Managed care has not yet permeated the region where this hospital is located. However, administrators and staff are cognizant of the changing health care environment. Questions and concerns about the impact of managed care are frequently expressed. The organization is attempting to position itself for the future by emphasizing outpatient services, reevaluating organizational structure and processes, and examining financial aspects of services.

The hospital administrative staff includes the hospital

director, senior associate hospital director, chief financial officer, medical director, and nurse executive. Four clinical divisions and three support divisions comprise the Department of Nursing (Appendix H). When this study began, there were individual directors for each division. However, the division director position for nursing administrative systems was eliminated seven months later. Currently, one of the division directors is responsible for a clinical division as well as the nursing administrative systems division. The nurse directors of the divisions report directly to the nurse executive.

Nurse managers are responsible for the management of one or more units in a division. Most units have an assistant nurse manager. Additionally, units have from one to four clinical head nurses or attending nurses. Registered nurses provide the majority of direct patient care. Staff registered nurses are represented by the collective bargaining arm of the state nurses' association.

Clinical nurse specialists, nurse practitioners, and other nurse specialists such as enterostomal therapists report to various clinical division directors. One clinical division director is responsible for the house managers. Clinical nurse educators and nursing education instructors report to the nursing education division director. Two nurses report to the division director for the Center for Nursing Research. The Division of Nursing Administrative

Systems has one registered nurse in addition to the director.

Each division director and nurse manager has an office, a secretary, and a computer. Clinical nurse specialists, nurse practitioners, house managers, clinical nurse educators, and nursing education instructors also have designated office space. Most have computers, and all have access to a computer. Some individuals share office space with a secretary and/or other unit personnel. Assistant nurse managers, clinical head nurses and attending nurses also have designated office space and access to a computer.

PCS

GRASP was the first PCS used at the medical center. According to those who were in nursing administrative roles at the time, there was general dissatisfaction with the GRASP system. Thus, shortly after coming to the medical center, the current nurse executive suggested that alternative systems be examined. She had previous experience using the Medicus PCS and recommended that this system be considered. A decision was made to change to the Medicus system after a group of nursing administrative staff evaluated a number of PCSs. Thus, the Medicus PCS has been used at the medical center for over nine years. Two years ago, a decision was made to upgrade the system to the most recent version, InterAct 2000. However, due to a number of interface and other systems issues, InterAct 2000 has not

yet been implemented. The system upgrade, InterAct 2000, was purchased for close to $30,000.00.

The Medicus system is a computerized factor evaluation PCS. This system was initially developed, and continues to be refined, by the Medicus Corporation in cooperation with health care organizations. The product is exclusively sold and supported by the Medicus Corporation. The annual fee paid to the Medicus Corporation by the medical center is $12,410.00. This fee allows the medical center to continue using the Medicus PCS. Additionally, the fee provides for unlimited telephone, and limited on-site, consultation by the Medicus Corporation. The annual contract also includes Medicus Corporation publications such as the InterAct Staffing/Productivity System National Comparative Data Book (MSC, 1994).

Procedures for operationalizing the Medicus PCS are established in each hospital based upon recommendations from the Medicus Corporation. Additionally, the medical center collaborates with the Medicus Corporation to establish expected acuity ranges, target hours per workload index, and percent staff distribution by shift for individual units. These values are integral to the system, and are considered to customize the system for the organization and each unit.

The medical center has the following guidelines for completing patient classification and providing reports to various managers. Each morning after report, and before

10:00 am, scantron forms[1] are completed for each patient by the registered nurse (RN) responsible for the individual patient's care. The Charge Nurse makes sure that scantrons have been filled out completely for each patient before the forms are sent to the Medicus Office. Once received in the office, clerical personnel process the scantrons using software obtained from the Medicus Corporation. Daily reports indicating individual patient and unit acuity scores, as well as recommended and actual staffing projected for the following three shifts, are printed and distributed to Nurse Managers, House Managers, and Division Directors. Biweekly, quarterly, and year-to-date reports are also generated and distributed to these individuals. Other individuals in the organization are on the distribution list and may choose to receive all, or only some, of the reports. These reports contain a variety of information. For example, one report indicates the actual and expected acuity ranges and targets for each unit; number of days lower than the minimum target, days greater than the maximum target, and number of days in the pre-established range. Another report supplies year-to-date information about the average census, acuity, and workload on each unit. Additionally, the report identifies actual and recommended staffing by shift and

[1] Examples of the scantron form and the reports generated by the Medicus system are not included in the appendix due to the contractual agreement between the medical center and the Medicus Corporation. The Medicus Corporation has not granted approval for the publication of these documents in this dissertation.

provides variance information. Information about groups of units clustered according to patient population and clinical division director is also provided in service total form. Multiple reports are available, and present the information in chart and graph formats.

The Medicus Corporation also recommends procedures to support system integrity. A registered nurse, the Medicus coordinator, at the medical center is responsible for coordinating orientation and continuing education regarding the Medicus system. Specifically, her focus is on accurate completion of the scantron forms. Manuals with descriptions and examples of all the indicators listed on the scantron are available on each unit. The Medicus coordinator updates the manuals and contacts a Medicus consultant when questions arise regarding the interpretation of indicators. Interrater reliability monitoring is also the responsibility of the Medicus coordinator. Monitoring is to be completed by designated clinical specialists and nurse educators on specific units at predetermined intervals. The Medicus coordinator is responsible for teaching these individuals how to conduct inter-rater reliability audits, conduct periodic inter-rater reliability checks between auditors, coordinate the unit audit schedules, make sure the audits are completed in a timely manner, and report the results to the nurse managers and division directors. The target score established by the medical center is 100%. The lowest

acceptable score is 90%.

## Study Participants

The sixty-seven (67) informants represented a range of positions, experience at the medical center, and educational preparation (Table 1). Sixty-one (61) of the informants were registered nurses and one was a licensed practical nurse. Four informants were non-nurse hospital administrators, and the remaining informant held a clerical position. All informants were caucasian with the exception of one informant who identified her race as Asian. Eight informants were male; four of these individuals were registered nurses. The informants' ages ranged from 24-62. Over half (55%) of the participants in the study were initially introduced to PCSs in organizations that used systems other than Medicus. The majority (84%) became familiar with Medicus during their employment at the medical center. Twelve (18%) informants received their initial information about the Medicus system from Medicus Corporation personnel. With three exceptions, these individuals were in nursing management positions when Medicus was implemented at the medical center. Two Medicus system support personnel were included in the educational sessions provided by Medicus Corporation consultants. Additionally, when a new nurse administrator responsible for the system was hired, she went to corporate headquarters to learn about Medicus. The remaining participants received their initial education about the Medicus system from the

Table 1.

Study Participants (N=67)

| | |
|---|---|
| **Current Position** | |
| Nurse Executive | 1 |
| Division Director | 5 |
| Nurse Manager | 11 |
| House Manager | 4 |
| Assistant Head Nurse | 6 |
| Clinical Head Nurse | 7 |
| Attending Nurse | 4 |
| Staff Nurse | 16 |
| Clinical Nurse Specialist | 2 |
| Nurse Educator | 3 |
| Medicus Support | 3 |
| Other Hospital Administrator | 5 |
| **Years in Current Position** | |
| Less than 1 year | 4 |
| 1-5 years | 35 |
| 6-10 years | 19 |
| 11-15 years | 8 |
| 16-20 years | 2 |
| More than 20 years | 0 |
| **Years Employed at The Medical Center** | |
| Less than 1 year | 2 |
| 1-5 years | 19 |
| 6-10 years | 18 |
| 11-15 years | 13 |
| 16-20 years | 10 |
| More than 20 years | 5 |
| **Highest Degree Attained** | |
| Diploma-High School | 1 |
| Diploma-Practical Nursing | 1 |
| Diploma-Nursing | 12 |
| Associate Degree-Nursing | 12 |
| Bachelors Degree-Nursing | 17 |
| Bachelors Degree-Other | 5 |
| Masters Degree-Nursing | 12 |
| Masters Degree-Other | 4 |
| Doctoral Degree-Nursing | 2 |
| Doctoral Degree-Other | 1 |

Division of Nursing Education, their nurse managers, or division directors.

## The Use of PCS Information

Data collection and analysis were guided by the research questions:

1. How is patient classification information used by hospital personnel in decision making?
   a. In what types of decisions is patient classification information used?
   b. What hospital personnel use patient classification information in decision making?
   c. To what extent is patient classification information used in these decision making processes?
2) Why is patient classification information used as the basis for some decisions and not others?

A constant comparative method of data analysis generated seven categories relating to how and why patient classification information is used in hospital decision making (Table 2). Six categories pertain to how PCS generated information is used in decision making. One category relates to why PCS information is used, or not used, in decision making. Findings associated with how patient classification information is used is presented

Table 2.

Patient Classification Information Use: Categories

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How Patient Classification Information is Used

* Planned Use
* Actual Use
* Actual Non-Use
* People Use it Differently
* Consistency of Use
* PCS Information as one Component of Decision Making

Why Patient Classification Information is Used

* Factors Influencing Use

first. This section is followed by the findings related to why patient classification information is used for some decisions and not others.

How Patient Classification Information is Used

Informants described the use of Medicus information in this organization in multiple ways. Six categories related to how PCS information is used emerged out of interview transcripts, field notes, and document analysis. These categories are; "planned use", "actual use", "actual non-use", "people use it differently", "consistency of use", and "PCS as one component of decision making". The categories "planned use", "actual use", and "actual non-use" reflect informants own planned use, actual use, or non-use of Medicus generated information. The category "actual use" also reflects which personnel groups use the information. The category "people use it differently" reflects differences in use of patient classification information. The "consistency of use" category reflects the patterns of Medicus information use by the informants. The category "PCS information as one component of decision making" reflects the use of other types of information in addition to information generated by the Medicus system.

Planned use

Eight informants (12%) indicated that there are plans to use Medicus information in the future. Two hospital administrators, the nurse executive, two nursing division

directors, a nurse manager, a clinical nurse specialist, and one of the Medicus support staff identified plans for the future. These plans include: analysis of practice patterns of nurses, identification of costs for groups of patients, establishment of standards for practice, and analysis of workload. Linking patient trend information with specific nurses was also identified as a planned use, as was the use of Medicus generated information in research. Using Medicus information to assist in negotiating managed care contracts was also mentioned. Additionally, use of the information to operationalize the American Nurses' Association report card is planned. A few of these planned uses are similar to those identified as actual uses. However, specific uses for PCS information identified in the planned use category differ from those identified in the current actual use category. For example, checking staff workload was described as a current use. This involves the sole use of Medicus information to compare actual staff workload to targeted workload. Plans for the future involve the use of Medicus information in combination with financial information to analyze a specific nurse's workload. Reactions to some of these planned uses vary. For example, a nurse manager commented positively about use of the information for research purposes:

> "I also see it as a valuable piece of outcome type research, which we're trying to embark on down here."

A skeptical view regarding use of the information for costing out care was voiced by a division director:

> "Well, we're about to embark on cost accounting where they do plan to use the data, and that goes back to my questions about how legitimate it is to use patient need data for costing out care that you are actually supposed to deliver. And how can you validate that you in fact delivered what you said the patient needed?"

Actual Use

Forty-eight informants (72%), representing all job categories, report using Medicus information for various purposes (Table 3). Some informants use Medicus information in more than one way, while others indicate they use the information for a single purpose. In addition to describing how the information is used, this category reflects who uses Medicus information. A brief description is provided for each use or sub-category.

Assign patients.

A clinical head nurse and two staff nurses from one unit described the use of Medicus information to make patient assignments for nurses on each shift.

> "We have a board out front that each of the Medicus is put in. We are not faithful with that, but we try. The reason for that is to split up patient acuity. If you have a nurse that has four patients all IV level on Medicus, she's running her tail off and somebody else

Table 3.

Sub-Categories of the Category: "Actual Use"

| |
|---|
| Assign Patients |
| Staff |
| Manage and/or Budget FTEs |
| Guide |
| Verify Judgement/Decisions/Intuition |
| Analyze Trends |
| Check Workload/Productivity |
| Track Performance |
| Explain |
| Justify |
| Defend |
| Compare |
| Determine Accuracy of Information |
| Project |
| Report |
| Develop a Data Base |
| Calculate Costs |
| Educate |
| Research |
| Satisfy Curiosity |

with II's and III's. So we try to put them up there in red marker each day. It gets erased and re-done every day, to split up patient acuity and load. Like I said, we're not real faithful with that, but we're working on it. It's something new we just started, ... maybe two or three months ago."

Staff.

Medicus information is used by some nurses for staffing purposes. Nurses who reported using Medicus information for shift to shift adjustment of staff included clinical head nurses, house managers, assistant nurse managers and nurse managers. Identifying the need for additional staff for the next one to two shifts was a common use of the information. Additionally, individuals who "cover the house" reported using the information to decide where to assign float personnel.

"...I cover the house, the managers and assistant managers cover the house, and my day is tomorrow. And so I would use it as -- for example, we're responsible for the Red Division, so if there's a float assignment, okay -- other than blatant calls meaning one unit had three call outs and it's not an option, you need the float, I may look at that to say, 'Who really is down?" because you may have all (the) units who are minimum staffed arguing for the float. I will use it in that way."

A few individuals identified using the information to identify which units might need assistance because of their staffing situation. For example, one director said:

> "I look at them (daily reports) to see who's over or understaffed, and who might be in trouble or might be in trouble trying to get rid of staffing, and sort of mentally tally whether that manager's up there, and whether they're probably dealing with it or not".

One clinical head nurse indicated that she used patient classification information to help make decisions about developing unit schedules. A director mentioned using the information to make suggestions to managers about staffing.

Manage and/or budget FTEs.

The nurse executive, all three clinical division directors, seven nurse managers and two clinical head nurses described the use of Medicus information to manage and/or budget FTEs. Individuals described reallocating staff during the fiscal year as well as using patient classification information in the budget development process.

> "And so I have in the past literally reallocated staff, not only at budget time but during the year if I think somebody is out of whack."

The use of Medicus information is used to propose increased numbers of staff for some units and decreased numbers of staff for other units. Reallocation of FTEs is more common than adding positions, however new positions have been

proposed and approved. One hospital administrator indicated that he had used the information when deciding to approve positions. Though the organization does not use a zero base budgeting approach, patient classification information is used "as a guide for our budgeting" and "checking to make sure the FTEs are okay". The nurse executive remarked that she used Medicus information to make decisions about the nursing department budget in relation to total hospital resource needs.

> "...and I even have shifted FTEs outside of my areas of responsibility, to other departments, where it's clear that placing resource in other departments is more beneficial to the institution as a whole rather than everything being hoarded by a department."

Guide.

Many informants described using Medicus generated information to guide their decision making. For example, one clinical division director said, "I use it as a guideline not a fixed absolute finite number". An assistant nurse manager expressed a similar opinion; "I do feel that it can be a guide". One house manager echoed the statement of a nurse manager when she said that she used it as "...a directional tool..." The nurse executive indicated "I use the Medicus data but it's not the only thing I use". Further discussion of the ways in which patient classification data is used in decision making is included in the category "PCS

information as a component of decision making".

Verify judgement, decisions and intuition.

A number of nurses, including a staff nurse and clinical head nurse, assistant nurse managers, nurse managers, house managers, and clinical division directors, described their use of Medicus information to verify their own or others judgement, decisions and intuition. One of the house managers describes her use of the information;

> "Sometimes just to see if my judgement was right, to say you know, one of the floors cried for help and I gave it to them, but was the need great enough? So I'll say, 'Oh, just let me take a look'. So I might do it just to see if I was on target".

The information is also used to verify the accuracy of other nurse's judgment. One nurse manager stated;

> "...If it's real busy and the staff are telling me it's very busy, I'll kind of look (at the acuity) and if we have a lot of high people, I know."

Another nurse manager described using Medicus information to retrospectively check her staffing decisions.

> "I don't mean to sound trite, but I kind of use it as a game for me, because again, I think of my past history, and what the unit is like, and the feel of the day, I can pretty much tell you what's going on and what I think's needed. And then when I get the Medicus--'Oh yeah. I was right.' Or, 'Oh no. I was way off.' So I

think it's nice..."

Additionally, some individuals report using Medicus information to validate their intuitive knowledge. For example, one clinical division director indicated that "...it has just over and over again confirmed my gut feelings".

Analyze trends.

The nurse executive, the clinical division directors, many nurse managers, and one clinical nurse specialist, reported using Medicus information to track trends over time. Patient acuity, nursing workload, actual versus recommended staffing, and census were specifically mentioned as important. One nurse manager stated:

> "It's a good piece of information for me to track my trends, and they have really changed over the last four years a lot. I think it's a good source of information for that because some of the financial and budgetary information isn't quite as detailed as what some of the patient classification information is."

A clinical division director described using the information to examine trends in her division:

> "So I do look at their two-week hours per workload index and their year-to-date. I look for trends and patterns off of it ... are there certain days of the week that tend to be staffed heavier than others, or that we could potentially readjust our staffing? I look

at how many days they're out of range. Basically I'm looking for patterns."

One clinical nurse specialist indicated she used PCS information to track acuity trends of a specific patient population cared for in two units.

Check workload/productivity.

Information generated by Medicus is used by the three clinical division directors and a few nurse managers to check staff workload and productivity. One clinical division director checks individual staff nurse workload when she receives complaints about patient care assignments. Additionally, she uses the information to compare actual versus targeted workload for each unit in her division. Another clinical division director described the following;

"What I do look at is, and I send my managers every month -- we get a stack of reports based on Medicus, and what I look at that time is what is the year-to-date patient acuity, what is the year-to-date hours per workload index, and I will make comments on that in terms of -- you know, the 1st floor recently was 4.99. Their target's 5.2. They were pretty busy. (The) ICU's was 6.1. I want to know, why were they running at 6.1, when their target is 6?"

One nurse manager indicated that actual workload compared to targeted workload was used in their weekly management meetings to identify which units were working the hardest.

Another nurse manager stated she looked at the bi-weekly reports "...to see if we're within the target ranges". When the unit is not within the target range, "I kind of look for what reasons, why that may not be."

Track performance.

Some nurse managers and clinical division directors use PCS information to track performance in regard to target hours and staffing. Nurse managers, and one assistant nurse manager, reported using the information to check their own decisions as well as those made by house managers and unit based nursing staff. One nurse manager describes her use of the data in one of her three units:

> "...I use it to compare what the reports tell me we should be using, with what I see that we actually used, and I use it as a guideline to just help me on a day-to-day basis to know whether we're staying in line. And when I see the outliers either way low or more, so that will trigger me to investigate what went on."

Another nurse manager stated:

> "And it's also a good check on my head nurses too, to make sure that they're not padding staffing, because I have very different personalities doing that, and so I can come to them on Monday when I get the weekend reports and say, 'How come you had this many people on Saturday?"

A clinical division director also described her use of the

information to check managers performance.

> "I do spend a fair amount of time looking at--are my people where they should be? Are they fat? Or is their target 6 and they're at 6.8? Is their target 5.2 and they're at 4.97?"

Explain.

A few nurses and one hospital administrator indicated their use of Medicus information to help explain other unit statistics. For example, a clinical division director reported using the information to explain variances in the budget. The hospital administrator described the variance analysis process as "...a joint effort between finance, the cost center manager, who might be nursing or any other cost center manager, and actually sometimes someone from administration." He indicated that Medicus information is used "...to really help explain the variance, to rationalize whether the variance was real or caused by inefficiency..." One clinical nurse specialist also said she used the information "...to help explain some of the other (unit) statistics."

Justify.

The nurse executive, all three clinical division directors, nine nurse managers, two house managers, an assistant nurse manager, a clinical head nurse, and three staff nurses described using Medicus information to justify their requests or decisions. Specifically, the information

is used to justify permanent and/or temporary staff adjustments. One nurse manager stated:

> "...For me everything is data driven, so whatever information I can utilize to justify my needs for the floor, I'll do that, and Medicus is one of those."

Only one individual described justifying a decrease in permanent budgeted positions. Others described using Medicus information to justify increases. For example, one clinical division director stated;

> "...There are times when I literally have requested new positions based on Medicus data and used it to justify."

One nurse manager commented that Medicus information;

> "...can be a good tool, especially in dealing with other areas of the hospital, the financial people, because it's a number and they like that. They can absorb that and deal with that, and that can sort of justify bodies and staffing."

Some house managers and staff nurses described their use of Medicus information to justify their requests or decisions regarding daily staffing. A house manager describes how she uses the information to justify her decisions to the staff:

> "And sometimes when census is low, and staff doesn't want to cut, I think that you can go down a person and they don't want to buy it. Well, 'Medicus says -- and your manager wants you to go by what Medicus says, so

you need to see if somebody wants to be given off today'."

Conversely, staff described using the information to justify the number of staff they think is necessary.

"Because like I said, for the staffing issues and that kind of thing, to make sure we have enough people on the floor. It's like -- I don't know what I would call it -- just something to kind of back up the numbers that we're choosing. Sometimes when the house manager comes around at night, you can say, 'Well, look at our Medicus. All these patients are really heavy. Can we keep the staff on tomorrow even though it gives us a few extra?' And they'll let you do that."

One nurse manager reported posting the daily Medicus reports to justify patient assignments.

Well, I posted it for the main reason -- we were having these 'My wing's busier', 'My wing's busier'. Well here's the data guys."

Defend.

One clinical division director frequently referred to the use of Medicus information to defend the resources that were allocated to her division. For example:

"For instance, my chronic goal in life is to defend the staffing in these areas... I don't have anything else to defend myself with... Well, I'm working on the angles."

A nurse manager also described his use of Medicus to defend the staffing in the unit.

> "I probably use it almost as a -- it sounds terrible, but almost like a defensive tool to defend our staffing and we make sure it's done right, because I know if it's not done right, and it's wrong, I'm going to lose staff."

Compare.

The clinical division directors reported using Medicus information to compare units within the organization. Additionally, they compare their units with similar units from other hospitals. Grouped hospital data reported in the national Medicus data book is used for external comparisons. For example, a director compares one of her units to a similar unit in the hospital.

> "I look at (similar) units. I look at the (other) intensive care unit compared to my intensive care unit. There's a big discrepancy. Why is that? Is it because my ICU's overstaffed? There may be a piece of that. Is it because the (other) intensive care unit's understaffed? I don't know. Is it because there's a difference between ICU patients? I think there's a piece of that. So I actually spend a fair amount of time looking at that."

Another director spoke about the comparison between her ICU and similar units in other hospitals. "...The Medicus data

shows that (this specialty) ICUs are giving 7 hours of care per patient, and we give 6.1."

One assistant nurse manager and two staff nurses also reported using Medicus information for comparisons. The assistant nurse manager has "...at times used the 24-hour Medicus that comes out that has all the units on it to see if the unit that got help was worse off than we were!" Both staff nurses looked at the Medicus printouts "to see how acute my patients are in comparison to everybody else's" and "... to see if there's like a nurse's aide that might be better suited to be down my way as opposed to the other wing."

Determine accuracy of information.

A few nurse managers, clinical head nurses, and staff nurses, plus one clinical nurse specialist described using Medicus information to determine the accuracy of the information. For example:

> "Sometimes I use it when I suspect that it's not accurate, and so I may look at the data and -- which is really objective in a sense, although that's not true either. But I look at it to compare what the numbers say to see if that's really what's happening."

Nurses also reported looking at the information to determine if patients were being classified accurately.

> "...like if I'm working with a patient, I want to see what they're classified as, and if they come up a II,

and I think they're a IV, then something's not right or people aren't marking what they're supposed to. I just like it for my -- I like to see them."

Project.

One clinical division director and one manager indicated their use of Medicus information for projections related to new programs. Both individuals described their use of the information to "project out the staffing requirements in the new unit".

Report.

All nurse managers include Medicus information on a monthly management report. This report is on the "f-drive" and is available to managers, directors, and the nurse executive. One nurse manager described the report:

"Well. it has a lot of data on it. There's a lot of FTEs, body counts, and then there's a lot of other stuff, like unit issues that you're looking at, and then indicators that Barbara Smith (nurse executive) wants, and some of those are off Medicus."

Develop a data base.

One clinical division director indicated that she was using Medicus information to develop a data base. Field notes state:

"Edna Corn showed me the spreadsheet she had developed. A variety of Medicus generated information such as acuity, target hours per workload index, actual hours

> per workload index, etc. were included. Edna described her plans to further develop a data base including Medicus information."

Additionally, a hospital administrator from finance stated that data from the Medicus System was being merged "with our files to get it into a database, an integrated database."

Calculate Costs.

A few individuals reported using Medicus information in combination with information from finance. For example, one nurse manager reported her attempts to "Look at financial data -- cost per patient day." The nurse executive reported one way she was using the information;

> "...we have finally gotten it, so we can actually look at how the primary nurses by DRG are impacting the financial system."

A hospital administrator from finance described his use of Medicus information:

> "...one of the reasons I guess I'm involved with acuity is we're trying to interface the acuity information into our financial decision support system so that we can do better costing and better financial analysis to see where we really make or lose money, and how much it really costs as opposed to using general averages based on per-day costs."

Educate.

A house manager, a nurse educator, and a few nurse

managers stated they used Medicus information to educate the nursing staff. The house manager uses it to teach about the Medicus system and the process of making staffing decisions. The nurse educator and nurse managers use the information to teach staff nurses about classifying patients, as well as the Medicus system. The house manager provided this description:

> "Well, as I go through my staffing sheets for the next shift, I just take my Medicus report and flip to 'projected' needs for the next day and make notations of the census that it was based on, and to the recommended staff, and just jot that down on each of the staffing sheets. Then as I make rounds, I receive report as to census and review staffing, and then if what they're saying their needs are -- the units needs are -- does not necessarily match with Medicus, then I ask them how things have changed, and sometimes it's very simple. There's been a decrease in census or an increase. However, I mainly try to have the staff think, 'How have things changed?' So I use it as a teaching tool..."

Research.

Some of the house managers reported using Medicus information as a component of a study they are conducting regarding staffing. Initially they had not planned to include Medicus as a data source. However, a nurse from the

Center for Nursing Research suggested they collect specific information generated by the system: "Research thought we should at least bring this data into play."

Satisfy curiosity.

A few staff nurses indicated that they occasionally "glanced" or looked at the patient acuities that were posted on the unit. They did not identify specific uses for the information. One nurse responded to a question regarding why she looked at it by saying;"Probably just for curiosity, just to see where the heavier patients are, or what people are classified." Another nurse stated that she looked at them "just because of interest, because they were there at the Charge Nurse's area, and I looked at them."

Actual Non-Use

A number of informants (n=19; 28%) indicated they did not use Medicus generated information for any purpose. The hospital director, two support division directors, two nurse managers, two assistant nurse managers, four clinical head nurses, one attending nurse, six staff nurses, and one of the Medicus support personnel stated they did not use the information.

The nurse executive and three nurse managers stated that they "do not use it for daily decision making." Additionally, one clinical division director, five nurse managers, two clinical head nurses and seven staff nurses indicated they did not use Medicus information for staffing

purposes. For example, one nurse manager said,

> "If you can cancel overtime, cancel it. If somebody wants off and you can give it to them, give it to them. If you can pull someone from a different unit, then you do that. But it's real difficult to say that Medicus has anything to do with it."

Two staff nurses mentioned that they did not use daily Medicus acuity information to make patient assignments, and one clinical head nurse mentioned that she did not use Medicus information when developing the four week staff schedule.

Budget development and FTE management were also identified by some informants as decision processes where Medicus information was not used. Three hospital administrators indicated that "at the level that I get the budgets, it's not (used)." Two nurse managers also stated that they did not use Medicus information in the budget development process because "...it's not actually used at my level in terms of doing the budget." One clinical division director said she did not use Medicus information for budget development; "We just have the FTEs we had before". The same informant said that she had used "just gut", not Medicus information, to determine where positions were to be cut when the Department of Nursing downsized a few years ago.

<u>People Use It Differently</u>

Information generated by the PCS was used differently

within personnel groups, and between personnel groups, clinical divisions, departments, and units. Analysis of interview data from the informants (n=48; 72%) who described using patient classification information revealed these differences. Additionally, 18 informants (27%) stated that the information was used differently within and between groups, divisions, departments and units. All three clinical division directors acknowledged differences in their use of Medicus information. One of the directors described how another director used the information differently than she did:

> "One of the other directors very much uses it for day-to-day staffing in terms of whether they have an FTE over or an FTE under, and part of that is I believe differences in terms of the kinds of patients we have."

Another division director described differences between nurse managers:

> "Others use it by saying, you know, yeah, we're going to stick to this schedule because Medicus says this is all I need. So why would I put an extra nurse on? You know, that kind of thing. I mean, they've made the decision for the staffing, and then somebody comes along and says do you think we really have enough people? And then they would say, yeah, we have enough people because Medicus says we have enough people. So, other managers wouldn't do that. (Some) managers would

> say okay, let's put somebody else on it if we have somebody else to bring in."

A nurse manager agreed that nurse managers used the information differently "because I know each manager has a different slant on what they do with this information." House managers and clinical head nurses also acknowledged differences in the use of Medicus information by their peers. The opinions expressed by these informants were supported by the data regarding "actual use" and "actual non-use".

Information generated by the PCSs was also used differently between personnel groups. For example, nurse managers tended to analyze trends for one unit, while clinical division directors examined trends for individual and groups of units. A clinical division director described her use of the information to look at groups of units:

> "Then quarterly we also get reports on the analysis by day of week, we get service reports that collapse across the intermediate care units and the floors and that kind of thing. And I also use that data in a very trending fashion."

In contrast, a nurse manager stated,

> "...It's a good guide for where the unit is going...I used it this year to track what my busiest days are. Should I be changing my staffing on those days? I've looked at it to see if our acuity is increasing."

Another clinical division director describes how use differs between roles:

> "But each one of those directors is looking at it differently than what that nurse manager is, and differently than what the charge nurse is for staffing. The information is used differently throughout. A staff nurse who's completing the form all the way through the nurse manager who's looking at her unit globally, all the way to the house manager who's looking at the whole institution, to the director levels who's trending information, to the (nurse executive) who's looking at it for budget and financial reasons."

These differences were also recognized by the nurse executive, who stated, "Well, various levels of people use it differently." The use of Medicus system information was also noted to vary by unit. For example, only two units used the information to guide patient-nurse assignments.

Consistency Of Use

Few informants (n=3; 4%) explicitly stated that they used Medicus information consistently. However, analysis of the interview data regarding "actual use", reveals consistent patterns of use by informants in the following job categories: hospital administrator, division director, nurse manager, house manager, assistant nurse manager, clinical head nurse, and staff nurse.

One clinical division director described her use of the

information;

> "I have to say I generally use it. I'm not sure I've ever not used it. There are times when I choose a different answer than Medicus, but it's not that I've not considered Medicus. It's that I've put it as a piece of a bigger picture."

Some informants described using the information for purposes that occur routinely, but not frequently. The annual budgeting process is an example. Thus, a number of individuals consistently, though infrequently, use the information for selected purposes. Responses from other informants regarding their use of Medicus information included: "It's a very rare instance"; "I don't use it that much"; "Probably less than 20 times in a year"; "It's sporadic"; "Periodically"; "Sometimes"; "Every two weeks".

PCS Information As One Component Of Decision Making

Those informants who use Medicus information in decision making (n=48; 72%) indicated that Medicus is not their only source of information. Many described considering multiple factors when making decisions. For example, the nurse executive stated, "I use Medicus data but it's not the only thing I use." When asked what other kinds of information she considers, she responded,

> "I think the physiologic condition of the patients. The amount of technology that's involved. Whether or not people can do well without the technology. So those are

> some sort of value-added sorts of things. Other things that come into consideration also include the geographic location of the patient - how far they are from various services. And the other thing I would say deals with the dynamics of family and family education and that sort of thing, based on where the person's going to go following discharge from the acute facility."

Later in the interview she commented, "I mean, basically I use it as one of many parameters." The clinical division directors reflected similar views about their use of Medicus information in decision making. One said, "It's...an indicator and gives me an idea of what's going on with them, but I look at what's happening with the patient. It's the total picture." Likewise, a nurse manager stated, "So there's a lot of factors that you filter through." A nurse educator who has acted as a house supervisor commented, "It's only one aspect of what you're looking at in the overall picture..." Interview data from other personnel groups also support this category.

All informants indicated the use of information in addition to that generated by the Medicus system. Types of information considered in decision making by the informants included: "practitioner's judgement"; "admissions and discharges"; "the way the floor functions"; "the staffing numbers"; "occupancy projections"; "staff and

patients...and...physicians (opinions)"; "types of patients"; "history"; "who's in charge"; "knowledge as a nurse"; "daily operations of the floor"; "skill level of people working"; "instinct"; "budget"; "staff input"; "manager's input"; "observations"; "targeted...hours"; "gut feeling"; "geographical areas"; "charge nurse input"; "minimal staffing patterns"; "call-outs"; "(number of) float people"; "census"; "financial constraints"; "what's going on in the units"; and, "how busy things have been."

Why Patient Classification Information Is Used

Informants (n=67; 100%) described many factors that influenced the use of Medicus generated information in decision making. One major category "factors influencing use", with 21 sub-categories, emerged during data analysis of interview transcripts and field notes (Table 4).

Factors Influencing Use

The category "factors influencing use" reflects informants (n=67; 100%) descriptions of factors that influence their own use, partial use, or non-use of the information. Additionally, perceptions of the factors that influence other individuals' use of Medicus generated information are reflected in this category. A brief description of each sub-category is presented below.

Individual characteristics.

Informants spoke about personal characteristics that influenced their use of Medicus generated information.

Table 4.

Sub-Categories of the Category: "Factors Influencing Use"

| |
|---|
| Individual Characteristics |
| Expectations |
| Staff Opinion |
| Operational Processes |
| Access |
| Time |
| Unit Characteristics |
| Decision Situation |
| Anticipated or Actual Change |
| Organizational FTE Allocation Process |
| Goals of Decision Makers |
| Organizational Culture |
| Knowledge and Experience |
| Position and Job Responsibilities |
| Recipient of Information |
| Ties and Commitments |
| Available Resources |
| Familiarity |
| System Administrator |
| Credibility |
| Sole Information Source |

Personal management styles as well as the extent to which individuals value numerical data were identified as individual characteristics that influenced use of the information. For example, in response to a question about why she uses the information, a clinical division director stated that "I'm also very much into, I'm fascinated by statistics...I love keeping tabs and looking at things from a statistical standpoint". On the other hand, when discussing her limited use of the information, the nurse executive stated, "People believe you can prove all this by data. I don't." An observation by a nurse educator also reflects the influence of individual characteristics: "I think some people are more comfortable with numbers and they feel that numbers are more accurate."

Expectations.

Informants spoke about how the expectations of others influenced their use of Medicus information. Most of the informants described the influence of expectations held by an individual to whom they reported. However, a few commented upon the expectations of peer managers. One clinical division director observed "I think the managers pretty much reflect the directors in terms of how closely they do it". A nurse manager described why she doesn't use Medicus information frequently;

"Well, I think it's because it hasn't been encouraged. I mean, I'm middle management. ...I have not been asked

> to use that as a tool. So that's probably the main reason why I don't. Now, if Florence Davis (clinical division director) said to me, 'Dimetra, I want you to trend this and follow this very closely. I want you to stay within your targets', then that would be a different ball game. Then I would do so. But that has not been requested".

In contrast, another nurse manager describes why he uses Medicus generated information. "I just know that my (clinical division director's) expectation is that everything is data driven, and so I'm going to use it..." A clinical head nurse also spoke about why she considers Medicus information;

> "So I have someone breathing down my neck now about it, so it's more important to me to look at and take note. ...And I don't say so much as they go down my neck, but they go on my nurse manager's neck, which then she goes to my assistant nurse manager or even directly to me and says, 'What's up? You know, what happened this night? Your Medicus is saying..."

One of the house managers described why house managers who don't use Medicus information frequently might choose to use it at particular times. She stated, "When the manager of a unit says, 'You will staff by Medicus and only Medicus', then it is used".

Staff opinion.

A few informants indicated that staff opinion about Medicus influences the use of information by managers. For example, one house manager said, "Medicus wouldn't be the first thing for me to go and show them because...I don't think the staff has much faith in Medicus".

Operational processes.

Use of Medicus generated information for daily staffing decisions was influenced by operational processes in this organization. Informants including individuals in positions from staff nurse through clinical division director spoke about the timeliness of the reports. Daily reports projecting actual and recommended staff for evening and night shift as well as the following day shift, were frequently not available until late in the afternoon or the following day. Some of the comments regarding the timeliness of the daily reports included: "Our reports come out...by about 1:30 in the afternoon. But that's really late for the evening shift"; "...it's not quick enough to do your staffing at 3:00 in the afternoon"; "...they're not generated until 3:30 or 4:00 in the afternoon, so by the time they get to me, it may or may not be a time when I get to see it that particular day"; and, "...it doesn't work day to day because you get the numbers the next day".

Additionally, informants indicated that Medicus reports are not updated every shift. Thus, the information for night shift and the following day shift does not reflect changes

that have occurred on the unit since patients were classified in the morning. One nurse manager stated; "...if you're projecting staffing for tomorrow morning based on what I'm telling you at 10 am today...it's crazy..." A staff nurse observed;

> "...things can change because you're doing that from 9 o'clock the day before, and those Medicus numbers don't come up until the next day. ...So that day before number is already long gone because you could have had 20 people in and out by the next morning".

Access.

Informants indicated that their access to Medicus reports influenced use of the information. While all clinical division directors, nurse managers, and house managers receive Medicus reports in their mailboxes, other nurses may not have access to the reports. Medicus printouts are not shared by some nurse managers: "I mean, I don't share Medicus data with them". A few nurse managers have printouts available in their office, while others place the printouts on a clipboard or in a notebook on the nursing unit. A few nurse managers posted the daily reports on their units. On one of the units where the daily report was being posted, a staff nurse stated;

> "Sometimes they were putting them up on the board of how the (patients) were classing out. And what we would use that with is when we were making assignments for

the upcoming shift, then we'd look at what the acuity is and try to break them up".

Most staff nurses indicated that they did not have access to the reports, and thus were not able to use the information. Staff nurse comments included: "I've never seen it on a staff nurse level. The charge nurses may, but I've never seen it"; "As far as a staff nurse's perspective, you don't even know what Medicus says"; "I've seen it laying out at the desk....if it is posted somewhere, I don't have a clue as to where it is". One clinical head noted "She (staff nurse) doesn't even get to see it. We (CHN) look at it"

Time.

A few informants mentioned the time involved in using Medicus in decision processes as a negative influence. The time involved in looking at the reports was mentioned by a few informants. Others described the time required to use the information for decision making. For example, one clinical division director described the use of the information for patient assignments;

"...it takes some calculation to get at that number and nobody's got the time to sit down and do that calculation. The type is readily available, but the hours of care the person needs is not readily available and so it takes calculation and to sit down and do that for seven groups, nobody's going to do that. That's 20 minutes of time before you could do assignments".

Unit Characteristics.

Unit characteristics such as patient population and unit design were identified as factors influencing the use of Medicus generated information for decision making. Some informants described the type of patients on a particular unit as an influencing factor. The characteristics of specific patient populations or specialties were identified as negatively or positively influencing the use of Medicus information. One clinical division director spoke about her choice not to use Medicus generated information for daily staffing in contrast to another clinical division director:

> "One of the other directors very much uses it for day-to-day staffing in terms of whether they have an FTE over or an FTE under, and part of that is I believe differences in terms of the kinds of patients we have."

Unit design influences the use of information generated by the Medicus system in some cases. For example, a clinical division director and some staff nurses described their inability to use fully the information to make assignments because of the configuration of the nursing unit. Another nurse manager who uses the information for staffing one of her units, describes why she doesn't use it on her other unit:

> "...physically, the way our unit is set up...we have a four bed unit down here; now we staff one nurse in there whether there's one patient or four patients, no

matter what Medicus tells us we need in there." Minimum staffing numbers established for some of the smaller units in the hospital also influenced the use of Medicus information.

Decision situation.

Situations that are perceived as difficult to resolve influence the use of Medicus generated information. One nurse manager indicated that she rarely used Medicus information to make decisions about staffing except when the unit has a very low census. Then she "...depend(s) on it more because it's tougher to staff when you're low census". Similarly, one informant who has functioned as a house manager described her choice to use the information: "I did utilize it...especially when it came to three floors needing a nurse, and them all demanding a nurse, and myself having to make a decision who gets it". A staff nurse described using the information to defend the number of staff on the unit to prevent someone being pulled to a different unit. Medicus information has also been used by at least two of the clinical division directors to reallocate positions when additional staff were needed on some units but budget constraints prevented the creation of new positions. In contrast to the increased use of Medicus information in some difficult situations, one informant stated, "I think if you're using it for staffing, and your whole ship's gone down, it really doesn't matter what the Medicus says".

Anticipated or actual change.

Medicus information is reported to be used more "in times of change...from the norm". For example, the nurse executive and another hospital administrator have recently started to use Medicus information to determine nursing resource use by DRG in response to the changing health care environment. Nurse managers and clinical division directors report their use of Medicus in response to possible changes in their budgeted positions. One clinical division director describes how she is preparing to use Medicus information to defend positions:

> "Well, I'm planning -- see this is my plan, my defense, because we are going to look at targets. We are going to -- I mean, that is on our list to do this year, to adjust targets, and Barbara Smith's (nurse executive) also looking to cut FTEs".

Field notes associated with this interview state:

> Edna Corn showed me the current target hours for each of her units. She then compared these target hours with those from the Medicus Data Book and indicated that she will use this comparison to justify maintaining the target hours at their current levels. She described using the information as a "defense" against change.

Organizational FTE allocation processes.

Many informants indicated that their prior experience with the methods of personnel budgeting and FTE allocation

in this organization influence their use of Medicus information for this purpose. For example, when asked why some people would choose not to use Medicus information in the budget process, one clinical division director indicated that "we have never really made any serious budget changes based on Medicus." A nurse manager stated:

> "I personally don't (use it for budgeting), but if I were to go for more positions, or if they were to take more positions--take positions away, we would certainly utilize it in that, but there's really no need for me to use it in budgeting. I have my allotted FTEs."

In contrast, a number of nurse managers and clinical division directors described using Medicus information for predicting future staffing needs and allocating resources because they "know that...(nursing administration)...has allocated staff based on it, and...they need to pay attention to it". One clinical division director who has used Medicus information in the past to obtain additional positions states, "I mean, I'm not out to get more (FTEs) than anybody else, but I want my fair share. And this is the mechanism to do it".

A number of informants anticipate the emphasis on cost containment to grow. They believe this focus will result in an increased use of Medicus information by nurses in the organization.

Goals of decision makers.

Medicus generated information is used selectively depending upon the situation. The information is more likely to be used when it is perceived to be helpful in regard to an individual's goals. Alternatively, the information is less likely to be used, and may even be hidden, if it is perceived to be non-supportive of desired goals. Informants reported that they, and others, use Medicus information selectively and to meet their needs. For example, one informant observed;

> "...there are people who also will believe in the data today and not believe in it tomorrow, and they'll use it today to their advantage and then criticize it tomorrow".

Other informants agreed with this observation. One of the clinical division directors provided an example;

> "...if the system says good things for you and supports your need for FTEs you'll support it; if it says you don't need that many FTEs, you won't...".

Organizational culture.

A few informants identified organizational culture as a factor influencing the use of information generated by the Medicus system. Specifically, they spoke about the value placed on the use of information in decision making. One clinical division director who believes that "...the more information you have, the better your decisions can be", stated, "I don't think the culture here is as supportive as

it could be". Other informants agreed. For example, one hospital administrator rated the organization "a six" , and another stated "we're about a five", out of a possible ten in response to a question about organizational expectations for the use of data in decision making.

Another aspect of organizational culture was mentioned by some informants. "To keep the peace" is a value that influences the use of Medicus information. One clinical division director described how decision making is affected;

> "...this is a culture that does not like conflict or confrontation. And because of that, they're going to try to fix the squeaky wheel...without someone complaining, ...rather than hold people accountable."

Knowledge and experience.

Two types of knowledge were identified as factors influencing the use of Medicus generated information: nursing knowledge, and knowledge of the Medicus system. Most of the nurse informants spoke about the influence of nursing knowledge. Many individuals spoke about their choice not to use Medicus generated information because of their ability to make decisions using their nursing knowledge. Informants also described the influence of other nurses' knowledge. For example, a house manager described her strategy for making staffing decisions:

> "I don't use it before I do the other things. I go out. I look at the acuity on the floor, I look at the

> patients myself if I have to. I talk to the charge people. I talk to some of the nurses working on the floor, and then I make my decision how to staff that floor. And if I'm still in doubt, because it's a new charge nurse or someone that doesn't fully understand, then I will go and use that as a directional tool."

The nurse executive, clinical division directors, nurse managers, house managers, and others commented on the importance of nursing knowledge. One clinical division director said;

> "I would always consider the nurses' judgement, I have to tell you. That weighs very heavy on my mind. If it's a seasoned practitioner. Now, if it's not a seasoned practitioner, it always weighs also; it just weighs differently. Because if a seasoned practitioner -- you have to listen to the nurse--if they're telling you they can't handle it, I don't care what Medicus says. They can't handle it."

Many informants also identified knowledge about the Medicus system as a factor influencing use of information. Increased knowledge and familiarity with the system, as well as with potential uses for the information, were associated with increased use. For example, one clinical division director said, "I'm probably the director who's used it the most because I'm so familiar with it". A number of informants commented about information provided in charge

nurse workshops or management training. Nurses who participated in these sessions reported increased understanding and use of the information.

There were, however, a number of informants who spoke about their lack of understanding influencing use of the information. For example, when a nurse manager was discussing her use of the information she commented; "All I know is I get a lot of papers, and I put them on a monthly management report. But I don't -- we recently-- and there were some other managers with me who said that would be great -- to better understand it". A clinical division director commented about staff nurse use of Medicus generated information, "But do I think the staff use it the way they could? No. I don't think they understand the system". Her observation was supported by many staff nurses who commented about their lack of understanding of the system and its uses. One staff nurse stated, "I have no clues on who figures it out, where it goes, how it's scored, what number we're supposed to have. I have no idea."

Various types of experience were also reported to influence the use of Medicus generated information. Experience with the Medicus system in another organization was identified as one influencing factor. Work experience in the organization was also mentioned as a factor influencing use of PCS information.

Some informants had used the Medicus PCS in another

hospital. They spoke about the influence of previous experience on their current use of Medicus generated information. The influence of previous experience was related to the knowledge of the system attained, as well as the expectations for use, in another organization. For example, a nurse manager stated, "I think I would use it very differently here if I had not come with the experience of Medicus that I have. I think I have a better working knowledge of it, because of what I learned previously." A clinical division director commented about the reason that she uses the information; "I've used it in the past...and we used it much more aggressively there"

Experience in the organization was also identified as a factor that influenced use of Medicus information. One nurse manager described it this way:

> "It's not that I'm resistant to using it, but I haven't had to depend upon it because I've grown up here, and I've been a staff nurse, and I really know what I'm talking about when I talk about patient needs. So I had an advantage of experience. But if I didn't, if I was new, I would definitely go for a tool like that. I would appreciate a tool like that".

Position and job responsibilities.

The influence of position and associated job responsibilities on the use of Medicus information were also described by the informants. One clinical division director,

when questioned about whether the use of information in the Department of Nursing varied by position, stated:

> "Oh yeah. A staff nurse who's completing the form all the way through the nurse manager who's looking at her unit globally, all the way to the nurse manager who's looking at the whole institution, to the director levels who's -- trending information to the director, who's looking at it for budget and financial reasons. Sure."

Interviews with other informants supported this perspective. For example, one of the clinical head nurses compared her current use of Medicus information to her use of it as staff nurse:

> "As a staff nurse, I didn't care to be honest with you. As a clinical head nurse, I take it into consideration more. ...I look at it more in a whole picture now. Also with scheduling. I'm involved in that now, and with scheduling issues it's a concern for me to know what our Medicus numbers are and where we stand."

A staff nurse observed a difference between house mangers and nurse managers:

> "But the house (managers) tends to often keep the numbers more in the positive than the negative. They would rather have more bodies than less, whereas the unit would rather have a little tighter because it's going to affect the budget."

A few informants suggested that the number of units a manager is responsible for supervising or managing influences the use of Medicus generated information. An assistant nurse manager indicated that she uses Medicus information for staffing only when she is responsible for covering more than one unit. One nurse manager anticipates a change in her use of Medicus information:

> "I'm going to have a lot more areas...like I used to go around every morning and do rounds, check what's going on...I might not be able to do that. So then I might use Medicus".

Recipient of information.

A number of informants indicated that use of Medicus generated information is influenced by the individuals or departments receiving the information. Recipients of information may request quantitative information. Alternatively, the use of numbers may be perceived to be important when communicating with some individuals or departments. For example, one informant stated:

> "...in justifying nursing and the cost of nursing and the number of staff we need, we're best able to convey that to hospital administrators if we talk to them in numbers. People in the business office, the accountants, relate to numbers. They don't understand what nurses do, and so I think we've done this to meet those needs, so we can talk to them in numbers."

Ties and commitments.

A few informants commented about the influence of ties and commitments on the use of information generated by the Medicus system. For example, the nurse executive commented about the use of Medicus information by clinical division directors to keep FTEs. One clinical division director acknowledged her use of the information to "...defend the staffing in these areas..." Staff nurses also mentioned use of the information to maintain desired staffing levels. Some informants acknowledged minimal or no use of Medicus generated information for decisions that would result in a loss of staff or other resources for their units or divisions.

Available resources.

Informants from staff nurse through clinical division director spoke about available resources as a factor influencing the use of Medicus generated information. One nurse manager described her choice not to use available information because "...in the cases where you need more staff, you just don't have staff to give." Alternately, some nurses who cover the house describe using Medicus generated information "...only when you were really pressed for resources, trying to really figure out (staffing)..." or "...when maybe two units were fighting over who should get the float pool." A number of informants described the budget as a factor that influenced their use of Medicus

information. For example, one nurse manager stated, "...you have to be in line with what your budget says...period." The nurse executive suggested that clinical division directors were increasing their use of use of Medicus generated information due to actual and potential financial pressures.

Familiarity.

Some nurse informants indicated that use of the information generated by the Medicus system was influenced by the extent to which decision makers were familiar with the daily activities of the nursing units. Many informants described individuals who provided patient care, or who were frequently on the nursing unit, as being more familiar with the unit. One nurse manager described why she chooses not to use Medicus information for staffing decisions; "I don't look at it as far as how much staff my unit needs, because I think I know what my units need. I'm around enough so I have a feel for it..." Another informant provided this description:

> "So when you use this for staffing, ...a nursing manager would look like a fool. I mean, no nursing manager would set themselves up and say, "Well, according to Medicus ... That would be like the sign of...Really, you'd be committed. If you know what's going on. If you're a nursing manager who's not in touch with your unit, it would be different."

However, another nurse manager indicated that she uses the

information:

> "...because it gives you a good indication. Especially like today, I'm in the office. I'm not out on the floor, and I have no clue as to what's going on. ...I need something to go on. I didn't hear morning report. In fact, I haven't been in the hospital the last two days. I was in a conference, so I'd use Medicus more in that (way), especially when I'm back here."

One staff nurse made the following observation;

> "Barbara Smith (nurse executive)...and Edna Corn (clinical division director) would be looking at the numbers because that's where they are. They're no longer on the floor. ...they're going to look at the numbers to tell them--this is the acuity, these are how many nurses we need..."

System administrator.

The administrator of the Medicus system changed during the course of this study. Informants interviewed throughout the study commented about the influence of the system administrator on the use of information generated from the Medicus system. The individual responsible for the system at the beginning of this research was perceived to have had a negative influence on the use of the information. One informant compared her to a previous administrator:

> "I mean, there was somebody (the previous system administrator) who knew what was going on, knew what it

meant, knew how to use the figures, and I think that you need someone that understands the system and utilizes it. She (current system administrator) isn't interested in Medicus."

After another individual became administratively responsible for the Medicus system, remarks from a conversation with a house manager and a nurse manager were recorded in the field notes.

Nurse manager: "She (system administrator) really knows what she is doing. She knows what Medicus can do for us. I think things are headed in the right direction."

House manager: "There is more emphasis on Medicus now. I'm paying more attention to it."

Credibility.

Informants expressed a wide range of beliefs regarding the credibility of the Medicus system and the resultant information. Multiple terms were used to express confidence, or lack of confidence, in the system. Statements regarding accuracy, goodness, trustworthiness, validity, reliability and believability reflected informants' views about the credibility of the system. Many identified credibility as a factor that influenced the extent and/or purpose for which they used Medicus generated information. Interestingly, a number of informants described using Medicus generated information in spite of hearing about or seeing evidence that caused them to question the credibility of the system.

Others used the information after considering similar evidence because they continued to think the information was believable.

When asked to describe what influenced use of Medicus generated information in decision making, a clinical division director said, "whether you believe the basic system is a good system." Another informant agreed, "you're not going to use the information if you think it's flawed, but you'll use it if you think it's accurate...you know, good information."

Some informants described how the credibility of the information influenced use. One nurse manager said "Why I don't use it...is because it's unrealistic...I don't need six extra staff. It's wrong." In contrast, a clinical division director spoke about using Medicus generated information to cut positions; "Well, it's comfortable...because I don't disbelieve the data for my division. I can't answer for the others, but it feels about right for my division."

Credibility also influenced the way in which the information was used. For example, a nurse manager said;

> "...it's become I think probably more of a guide and not a set standard as to what you can run with or what you can't run with, because I've found that...a lot of physical care that has to be delivered to the patients...I really don't feel is captured with the

current Medicus system."

A number of informants indicated they use Medicus information even though they had heard or seen evidence suggesting that the information is not accurate or reliable. For example, a house manager described using Medicus generated information to make and explain staffing decisions after hearing that the information was not accurate.

> "And I think it is actually only 40% accurate or something like that. I forget where I read or heard that. But I think it's a really good tool just to give people an idea of where the needs really are. I mean, I find it to be fairly accurate and fairly helpful."

Similarly, a clinical division director spoke about her use of the information even when the interrater reliability scores were below 90%. "I mean, I don't worry about it when they're fussing about it because the numbers make sense to me."

Sole information source.

A few informants described using the information generated by the Medicus system because of the lack of other sources of quantitative information regarding patient acuity and nursing care requirements. As one clinical division director commented, "We have no other data to use."

## Summary of Results

Seven categories reflecting the use of patient classification information in hospital decision making

emerged from constant comparison of the data collected during this organizational case study. Six categories relate to how patient classification information is used. These categories are; "planned use", "actual use", "actual non-use", "people use it differently", "consistency of use", and "PCS as one component of decision making". One category, "factors influencing use", relates to why patient classification information is used for some decisions and not others.

The category "planned use" focuses on the various uses of Medicus information planned for the future. "Actual use" reflects the current uses of patient classification information reported by the informants. Twenty sub-categories describing actual information use were identified. The category "actual non-use" focuses on the purposes for which information generated by the Medicus system is not used. "People use it differently" is a category which reflects differences in the use of patient classification information throughout the organization. The category "consistency of use" focuses on patterns of Medicus generated information use reported by the informants. "PCS as one component of decision making" reflects the use of other types of information in addition to information generated by the Medicus system. The category, "factors influencing use", relates to why patient classification information is used for some decisions and not others. This

category includes 21 sub-categories. Collectively, these categories reveal how and why information obtained from an automated PCS is used by hospital personnel in decision making in one organization.

# Chapter 5

# DISCUSSION

A review of the patient classification and organizational decision making literature supported the conduct of an organizational case study using a qualitative design. This was the first known effort to investigate the actual use of information generated by an automated nursing information system. Additionally, this study is one of the few that examines the "real life" use of information in organizational decision making.

The use of a constant comparative process for data analysis resulted in the induction of seven categories relating to how and why patient classification information is used in decision making. These findings contribute to knowledge regarding the use of patient classification information, and also inform organizational decision making theory.

This chapter begins with a discussion of study findings and a comparison of the findings with existing theories and research regarding patient classification information use in decision making. This section is followed by a discussion of implications for administrators and information system vendors. Implications related to theory development are addressed. An inductively derived set of propositional statements regarding information use in decision making is also presented. The chapter concludes with suggestions for

future research.

## Interpretation of the Results

A brief summary of the findings regarding how and why patient classification information is used, and not used, within an organization follows. A discussion of the linkages between the findings and the theoretical and empirical literature is included. Table 5 provides a display comparing the findings from this case study to the literature.

### How and Why Patient Classification Information is Used

Six categories related to **how** patient classification information is used emerged out of interview transcripts, field notes, and document analysis. These categories include "planned use", "actual use", "actual non-use", "people use it differently", "consistency of use", and "PCS information as one component of decision making". One category, "factors influencing use", relates to **why** PCS information is used, or not used, in decision making.

### Planned Use

The category "planned use" reflects how the informants plan to use the information in the future. The findings are consistent with the recommendations for use reflected in the patient classification literature published in the 1990s. For example, Finnegan, et al. (1993) indicated that integration with other electronic information systems is essential for linking patient outcomes, cost of care, and quality measurements. Specific uses emphasized in the 1990s

Table 5.

Comparison of Case Study Findings to the Theoretical and Empirical Literature

| Case Study Findings | Consistent With Literature[1] | Inconsistent With Literature | Not Reflected in Existing Literature |
|---|---|---|---|
| "Planned Use" Category | PCS | | * Plan to analyze patterns and trends associated with individual nurses.<br>* Plan to use PCS information to establish standards for practice. |
| "Actual Use" Category | PCS | PCS[2] | * PCS use to defend resources.<br>* PCS use to determine accuracy of information generated by the PCS.<br>* PCS use to satisfy curiosity. |
| "Actual Non-Use" Category | PCS<br>Decision | | * Identification of the specific ways PCS information is not used. |

[1] Findings from this organizational case study were consistent with the theoretical and/or empirical literature regarding PCS and/or organizational decision making. The specific body of literature is indicated by the terms "PCS" and "Decision".

[2] All the actual uses identified by informants are identified in the PCS literature. However, Krause (1988) reported that the most common use of PCS information was for staffing decisions. The most frequently reported use of PCS information in this study was for justifying requests or decisions.

| Case Study Findings | Consistent With Literature | Inconsistent With Literature | Not Reflected in Existing Literature |
|---|---|---|---|
| "People Use It Differently" Category | PCS Decision | | * Description of differences in use of PCS information between and within groups. |
| "Consistency of Use" Category | Decision | | * Identification of patterns of use/non-use. |
| "PCS Information as One Component of Decision Making" Category | PCS Decision | | |
| "Factors Influencing Use" Category | PCS Decision | PCS[3] | * Influence of unit characteristics.<br>* Influence of familiarity with daily activities.<br>* Description of specific organizational processes influencing use.<br>* Influence of nursing (professional, non-managerial) knowledge. |

[3] Findings from this case study do not reflect that validity and reliability of the PCS instrument or system influence information use. This finding contrasts significantly with assumptions in the PCS literature.

literature focus on connecting nursing resource use with cost and outcome (Adams, 1995; Finnegan, 1993; Finnegan et al., 1993; Levenstam & Engberg, 1993). The majority of planned uses described by informants in this study focused on outcomes, cost, and quality and involved the linkage of Medicus information with information generated by other information systems within the organization. Plans to use patient classification information for financial calculations such as costing out nursing care and tracking acuity by DRG were also identified in the only published study (Krause, 1988) regarding use of patient classification information. The use of the information generated by these systems for financial purposes has been, and continues to be, of interest to administrators. Additionally, informants described plans to use Medicus generated information in research. Use of the information in research is also described in the patient classification literature (Bostrom, 1992; Bostrom & Mitchell, 1991; Eckhart, 1993; Sherman & Jones, 1995). Positive and negative views about planned uses were expressed by informants and are evident in the literature.

Informants in this study identified two specific planned uses that are not reflected in the literature. Using Medicus information to analyze patterns and trends associated with individual nurses was mentioned as a plan for the future. This planned use is consistent with the

emphasis of the 1990s literature in that it requires a link between the Medicus system and other information systems. However, the literature has not suggested using patient classification information to focus on practice patterns of individual nurses. Additionally, informants in this study indicated that patient classification information would be used in the future to establish standards for practice. The literature does not discuss this particular use of patient classification information.

Actual Use

The "actual use" category reflects how Medicus generated information is actually used in the organization. Twenty sub-categories of actual use were identified. The majority of ways the informants described using the information are consistent with the uses identified in the patient classification literature. However, it is important to note that the literature describes a number of uses that were not evident in this organization.

The following uses were identified by the informants in this study: assigning patients; staffing; managing and/or budgeting FTEs; guiding decision making; verifying judgement, decisions and/or intuition; analyzing trends; checking workload/productivity; tracking performance; explaining; justifying; comparing; projecting; developing data bases; calculating costs; and educating. All of these uses are described in the patient classification literature.

Informants also indicated Medicus information was used in research. This use is reflected in the literature as well.

To date, only one other study (Krause, 1988) has examined the actual use of information generated by PCSs. Findings from Krause's research indicated that the most common use of PCS information was to assist the nursing department with staffing decisions. While informants reported using the information for staffing, this was not the most common use of the information reported in this study. The most dominant use of information in this study was for justifying requests or decisions. Verifying judgements or decisions, managing or budgeting FTEs, staffing, and analyzing trends, were also reported by ten or more of the 67 total informants.

Krause (1988) found the second major use for PCS information was nursing finance. The majority of respondents indicated interest in this application, however, few had used PCS information for budget development. Use of the information for financial decision making appeared to be a planned, rather than actual, use for the majority of the respondents in Krause's study. This finding contrasts with the findings from this research. Use of patient classification information for managing and/or budgeting FTEs was one of the top three uses identified, reported by 14 respondents. Additionally, five informants described using the information for financial calculations regarding

the cost of nursing care. This use is consistent with the findings reported by Krause. While the majority of respondents in Krause's (1988) study indicated their interest in costing out nursing care, few stated they used the information for this purpose. Thirteen percent reported using the information to track acuity levels by DRG. Informants in this study described their preliminary work in this area and discussed their plans for the future.

Krause (1988) reported three additional uses for PCS information as well. Information was used to validate acuity levels, increase staff awareness of acuity levels, and as a data source for comparison with other hospitals using the same PCS. Informants in this case study also reported using the information for the purposes of verification, education, and comparison. While the information was used to verify personal judgement regarding acuity levels, informants in this study reported using the information to verify various decisions as well. Informants also described using the information to educate, however acuity levels were not the only focus. Patient classification information was also used to teach about the functions and potentials of the Medicus system. Informants in this study also reported using the information to make comparisons. Comparisons were made with other hospitals using the Medicus system. Additionally, the information was used to compare units within the organization and patient assignment loads within a unit.

Informants in this case study identified uses of Medicus information that are not explicitly identified in the patient classification literature. For example, some informants described using the information to defend resources. While the use of the information to "defend" is not specifically addressed in the literature, this use could be inferred from some of the articles regarding the use of patient classification information in financial negotiations. Informants also described using the information to determine if patients had been classified accurately or the system was reflective of the acuity on the unit. Using Medicus information to determine the accuracy of the information generated by the system was not mentioned in the patient classification literature as a recommended or actual use. The literature reflects use of the information to verify nurse's perceptions of patient acuity. However, in this organization, nurses described comparing the information generated by the PCS to their judgement about acuity to determine if the information generated by the system was accurate. This evaluation led to conclusions about accuracy of the patient classification completed by the staff nurses as well as credibility of the system.

Another use of Medicus information was identified. Informants in this organization stated the information was used in management reports. These reports did not require calculations or conclusions based upon the use of Medicus

information. Using patient classification information for reporting purposes could be inferred from the literature, however, the use of the information for this purpose was not explicitly discussed. Use of Medicus information to satisfy curiosity was also described by informants. This particular use is not reflected in the patient classification literature.

Actual Non-use

The "actual non-use" category focuses on non-use of information generated by the Medicus system. Research reported by Krause (1988) indicated that many nurse administrators were interested in, but not currently using patient classification information for developing budgets, costing out nursing care, or tracking acuity level by DRG. Results of this case study reflect some informants' non-use of Medicus information for these and other purposes.

A number of informants stated they did not use the information for any purpose. Other informants indicated they used Medicus information, but also described specific ways in which they chose not to use the information. These findings are consistent with some of the recent organizational decision making research that provides evidence that information is not always used even when available (Browne, 1993). Additionally, these findings reflect a theme that has been apparent since the 1970s in the patient classification literature. While the majority of

publications regarding patient classification support and describe potential uses of the information, a number of authors discuss the underuse of information generated by these systems (Curtin, 1984, 1986; DeGroot, 1994a; Finnigan, 1994; Giovannetti & Mayer, 1984; Strickland & Neely, 1995; Tilquin, 1977; Van Slyck, 1991a). These articles do not specifically identify ways in which the information is not used. However, underuse of the information is discussed and assumptions about the reason(s) for this phenomenon are described. Factors considered to inhibit the use of patient classification information will be explored when the "factors influencing use "category is discussed.

People Use It Differently

"People use it differently" is a category that reflects differences in the use of patient classification information throughout the organization. Findings from this case study reveal that information generated from the PCS is used differently within and between groups. The finding that information is used differently by individuals in different positions or roles is consistent with organizational decision making theory and research (Majchrzak, 1986; McClure, 1980; O'Reilly, 1982). Although the decision making literature does not focus specifically on information use within groups as compared to the use of information between groups, studies have indicated that multiple influences result in individuals holding the same position or role to

use information differently (Averett, 1991; Florio & DeMartini, 1993; Perkins & Rao, 1990). Thus, the findings from this case study regarding the differences in patient classification information use within and between groups is consistent with the findings from other organizational decision making research.

The patient classification literature infers that patient classification information is used differently by decision makers holding different roles. For example, articles written for a target audience of nurse managers are apt to reflect the use of the information for staffing purposes (Gallagher, 1987). However, articles written for nurse administrators include information regarding the use of patient classification information to negotiate managed care contracts (Giovannetti & Johnson, 1990). Additionally, the literature infers, rather than explicitly describes, differences in information use within roles. For example, discussion regarding underuse of patient classification information suggests that individuals in similar positions do not use the information to the same extent (Finnigan, 1994; Giovannetti & Mayer, 1984). Findings from the only other research (Krause, 1988) regarding the actual use of patient classification information appear to reflect differences in the use of the information within a group of nurse administrators. However, Krause reported that the questionnaires were sent with a letter requesting the nurse

administrator or designee to complete the survey. Thus, while differences in use were reported, it is impossible to determine whether the differences were between or within a group of individuals holding similar positions.

Consistency of Use

The category "consistency of use" reflects the finding that patient classification information is used in consistent patterns. Few informants use the information all of the time. However, they described using the information routinely for specific purposes. Use of the information during the annual budgeting process is an example. Another example is the use of patient classification information to "defend" positions or staffing needs.

An underlying assumption of the majority of patient classification literature is that information will be used if available. While concern is expressed about underuse of the information, patterns of use and/or non-use are not explicitly addressed.

Recent theory and research published in the organizational decision making literature suggests that the use of information in decision making may occur in consistent patterns. March (1997) and Zhou (1997) indicate there is mounting evidence to suggest that organizational decision making is a process best characterized as rule-following behavior. This suggests that use of information in decision making follows predictable behavior patterns based

upon implicit or explicit rules. The findings of this case study support the notion of the use of information as predictable behavior patterns. However, rule following was not specifically identified.

PCS Information as One Component of Decision Making

The category "PCS information as a component of decision making" reflects the use of other types of information in addition to information generated by the Medicus system. All informants who use patient classification information in decision making indicated that Medicus is not their only source of information.

The patient classification literature focuses on the use of the information generated by these systems, however use of additional information in decision making is mentioned. The literature explicitly recommends the use of additional information in some cases. For example, articles describing the use of patient classification information to link nursing resource use with cost and outcome advocate the use of information from additional information sources such as patient care and financial information systems (Adams, 1995; Finnigan, 1993; Finnegan et al., 1993; Levenstam & Engberg, 1993). The patient classification literature also acknowledges that nurses may use other sources of information to make decisions. These discussions focused on underuse of patient classification information and recommended ways to get nurses to decrease their reliance on

"subjective" sources of information (Alward, 1983; Finnegan, 1994; Giovannetti, 1985; Noyes, 1994). Informants in this case study reported using both "objective" (e.g., number of admissions) and "subjective" (e.g., instinct) information in decision making.

Research conducted by Krause (1988) did not specifically focus on the use of information sources in addition to, or instead of, patient classification generated information. However, the findings suggest that respondents used additional information to make decisions. For example, respondents used patient classification "some of the time" (p. 193) for staffing due to lack of available staff. Information about the number of staff available, in addition to the recommendations generated by the PCS, thus was used to make staffing decisions. Organizational decision theory and research also reflect the use of multiple sources of information in decision making. Sources of information used in organizational decision making range from informal to formal, and, subjective to objective (Florio & De Martini, 1993; McClure, 1980; Saunders & Jones, 1990). The findings in this case study are consistent with those in previously conducted research.

Factors Influencing Use

The category "factors influencing use" reflects informants' descriptions of factors that influence the use of patient classification information. These factors were

described as influencing use and non-use of the information. The majority of the factors influencing the use of patient classification information identified in this case study are consistent with those described in the patient classification and organizational decision making literature.

The influence of individual characteristics on the use of information was described by informants in this case study. This factor is described in the organizational decision making literature (Polykarpou, 1992). Additionally, research conducted by Averett (1991) revealed that personal cognitive style influenced the use of information generated by an electronic information system. The patient classification literature does not discuss the influence of individual characteristics on information use.

The findings from this case study reflect the influence of expectations for information use by supervisors as well as peer managers. Organizational decision making research supports the influence of organizational rewards and incentives (Majchrzak, 1986), but does not specifically address the influence of supervisors and peers. However, it is important to note that supervisors and peers are responsible for the rewards and incentives in organizations. Expectations were not mentioned as a factor thought to influence information use in the patient classification literature.

Staff opinion was identified as a factor influencing use of patient classification information in this organizational case study. This factor is not mentioned in the patient classification literature or in organizational decision making research. However, political theories of organizational decision making suggest that information is more likely to be used when it is acceptable to all stakeholders (Browne, 1993; Cyert & March, 1963; Lindblom, 1959).

Operational processes affecting the timeliness and relevance of PCS generated information influenced the use of information in this study. The influence of operational processes was not specifically identified in the patient classification or organizational decision making literature. However, Finnigan et al. (1993) suggested that relevance of patient classification information influences information use. The influences of information timeliness and relevance are consistent with organizational decision making theory and research (Majchrzak, 1986; Sproull & Zubrow, 1981).

Another factor, accessibility of information, was found to influence the use of patient classification information. This factor is frequently described in the organizational decision making and patient classification literature (Diggs, 1986; Porter-O'Grady, 1985; Sproull & Zubrow, 1981). Additionally, research findings support the theory that access (McClure & Samuels, 1985; O'Reilly, 1982) influences

the use of information.

Informants in this case study identified the time required to use information as a factor influencing their use of patient classification information. The influence of time has been described in the organizational decision making and patient classification literature (Cyert & March, 1963; Finnigan, 1993; Ganti & Young, 1983; Lawson et al., 1993; Monroe et al., 1991). However, there is no evidence of other research regarding the influence of time on information use.

Characteristics of the nursing units such as patient population and unit design were identified as factors influencing the use of patient classification information in this study. However, factors such as these are not described in either the organizational decision making or patient classification literature. Perhaps, as Florio and DeMartini (1993) suggest, the use of any type of information is part of a complex process involving multiple sources of information and is influenced by the set of circumstances involving an interaction of the information.

Informants described how difficult situations influenced use of patient classification information. Situations involving decisions that were hard to make influenced increased use of the information. However, crisis situations resulted in less use of patient classification information. The patient classification literature does not

suggest that difficult situations influence the use of patient classification information. However, most theories of decision making suggest the occasion for decision influences use of information (Cohen, March, & Olsen, 1972; Kefford, 1994). Certainly, difficult situations create opportunities for use of information. One study reflected the influence of one type of difficult situation. Molloy (1990) found information technology was used less often for decisions identified as crisis decisions. Molloy's results are consistent with the findings of this study. Interestingly, since crises require more immediate solutions than those situations that are not classified as such, time may actually be the factor that influences the use of information in this type of difficult situation.

Scope of responsibility was identified by the informants in this study as a factor influencing the use of information. This category is differentiated from the position category since scope of responsibility in this organization was not necessarily associated with job title. Scope of responsibility was not identified as a factor influencing use of information in the patient classification literature. However, organizational decision making research findings indicate that job characteristics (McClure, 1980) influence information use. Scope of responsibility may be a job characteristic associated with position and role, however, this factor was not specifically examined in

previous research.

Informants in this study indicated that use of information generated by Medicus was influenced by anticipated or actual change in the organizational environment. This finding is consistent with the assumption reflected in the patient classification literature that the changing health care environment influences information use. For example, the literature of the 1990s suggests increased use of PCS information to manage costs in the changing health care environment (Bigbee et al., 1992; DeGroot, 1994a; Kelleher, 1992; Prescott et al., 1991; Sherman & Jones, 1995). Similarly, the organizational decision making literature implies that anticipated or actual change in organizational environment will influence the use of information, but does not address change specifically. Since change implies an increase in the number of decision opportunities, and decision opportunities influence information use (Cohen et al., 1972; Kefford, 1994), then use of information is likely to be influenced by anticipated or actual change. Additionally, change suggests uncertainty and threatens the status quo. Use of information in circumstances of change may thus be influenced by the need to support decision maker's goals and feelings of control (Browne, 1993; Einhorn & Hogarth, 1978, Langer, 1983; Pashiardis, 1994; Pfeffer, 1981; Schwenk, 1986).

The process used in the organization to allocate FTEs

influenced the use of PCS information according to informants in this case study. Organizational processes are not identified in the patient classification literature as factors influencing information use. However, the organizational decision making literature suggests that organizations have established processes, or rules, to manage information and regulate decision making (Day & Nedungadi, 1994; March, 1997; Zhou, 1997). Rules focus and allocate attention as well as define the information needed for decision making. Informants in this case study indicated their past experience with the process used for FTE allocation influenced use of patient classification information. This finding is consistent with the view of decisions as rule based actions. From this perspective, previous experience plays a part in the development of decision rules for accepting or rejecting information (Day & Nedungadi, 1994; March, 1997).

The goals of the decision maker influenced the use of information according to informants in this case study. Patient classification information was more likely to be used when it supported the goals of the decision maker. This factor is not explicitly mentioned in the patient classification literature. However, the underlying assumption is that the nurse administrator will use the information to achieve desired goals. The literature does not discuss the possibility of choosing to ignore patient

classification information if the outcome of information use would be less than desired. In contrast, the influence of the goals of the decision maker are well documented in the organizational decision making literature (Browne, 1993). Research conducted by Langley (1989) and Bourgeois and Nizet (1993) found that information collection and use was influenced by the goals of those involved in the decision making process.

Organizational culture, and the associated value placed on the use of information in decision making, was also identified as a factor that influences the use of information. The patient classification literature does not mention the influence of organizational culture on information use. In contrast, the organizational decision making literature discusses the influence of organizational values and norms on the use of information (Christensen, 1988; Deal & Kennedy, 1982; Pashiardis, 1994; March, 1997; Zhou, 1997). Williams and Bank (1984) examined the use of instructional information systems in schools. They found that information use was influenced by the compatibility of the information system with the culture of the school.

Informants in this study identified knowledge and experience as factors that influenced the use of patient classification information. Knowledge about the Medicus system as well as experience using the Medicus system in another organization influenced the use of information. The

use of patient classification information was also influenced by nursing knowledge and experience as a nurse in the organization. The patient classification literature suggests that understanding how a PCS works (Ames & Madsen, 1981; Meijers, 1982; Taylor & Hagey, 1995) will influence the use of information. Results from organizational decision making research support the influence of knowledge on the use of information. For example, McClure and Samuels (1985) found that information is more likely to be used the more familiar a decision maker is with an information source. The ability to understand information also influences use (Majchrzak, 1986), as does user experience with a system (Molloy, 1990).

Nursing knowledge was not specifically identified as a factor influencing use of information generated by a PCS. However, DeGroot (1989b) referred to nurse executive expertise as an influencing factor. Whether DeGroot considers nursing knowledge a component of executive expertise is unknown. Perkins and Rao (1990) found that experienced marketing managers used information differently than managers with less experience and knowledge. Thus, there is evidence in the organizational decision making literature that knowledge and experience influence information use. The findings from this study are consistent with the literature. Additionally, these results suggest the influence of professional, non-managerial knowledge on the

use of information.

The position held by a decision maker influences the use of PCS information according to informants in this study. The patient classification literature does not explicitly state, but rather infers, that patient classification information is used differently by decision makers holding different positions. The organizational decision making literature suggests that position in an organization (O'Reilly, 1982) and role (Majchrzak, 1986) influence information use. Research conducted by Majchrzak (1986) and McClure (1980) lends support to the theory that role and job characteristics influence the use of information.

Informants in this case study reported that recipients of the information influenced use of patient classification information. For example, some departments are perceived to desire quantitative information, whereas other groups would rather communicate without using numbers. The patient classification literature advocates using the information when communicating to other hospital administrators (Culpepper, 1984; Duraiswamy et al., 1981; Edwardson, 1985; Porter-O'Grady, 1985; Van Slyck, 1982). However, discussion of the recipient of information as an influence on information use is not apparent. The same is true of the organizational decision making literature. This literature does, however, suggest that information use is influenced by

the value of information to the decision maker (Bickel & Cooley, 1985; Harrison, 1987; March, 1982; Sproull & Zubrow, 1981). Thus, attempting to address the information needs of specific audiences may influence information use because the value of information is associated with the ability to achieve a desired goal.

Ties and commitments to a particular unit, division, or department influenced the use of information according to informants in this case study. Specific discussion of ties and commitments, or loyalties, as factors influencing information use was not evident in the patient classification literature. However, this factor is discussed in the organizational decision making literature. Specifically, the political model of decision making suggests the influence of ties and commitments to constituencies (Morgan, 1986; Pfeffer, 1987; Pfeffer & Salancik, 1974; Salancik & Brindle, 1997) on the use of information. This factor has not been reported in research literature. Thus, the findings from this case study are the first to support the theorized relationship between ties and commitments to constituencies and the use of information.

Informants in this case study reported that availability of resources, such as number of available staff, influenced the use of patient classification information. This factor has been described in the patient classification (Finnigan, 1993; Finnigan et al., 1993;

Huckabay & Skonieczny, 1981; Krause, 1988) and organizational decision making literature (Burstein, 1984; Harrison, 1987). In fact, the influence of resources on organizational decision making is thoroughly described in the literature regarding the well known bounded rationality models of organizational decision making (Cyert & March, 1963; Browne, 1993; March; 1997). However, published studies specifically focusing on the influence of resources on information use are not evident. The findings from this case study support the bounded rationality models of decision making regarding the influence of resources on the use of information.

Informants described familiarity with the daily activities of the nursing units as a factor that influenced the use of patient classification information. Increased reliance on PCS information was associated with a lack of familiarity about daily unit activities. The influence of familiarity was not discussed in the patient classification or organizational decision making literature.

The system administrator was identified as a factor influencing the use of patient classification information in this case study. Expertise of the nurse executive (DeGroot, 1989b) was described in the patient classification literature. However, there was no mention of the PCS administrator as a potential influence on the use of information. The organizational decision making literature

also does not specifically address the influence of an administrator responsible for an information source. The only research that could be considered connected to this factor was conducted by Molloy (1990). The findings from this study provided evidence that organizational support for specific information technology positively influenced use. One consideration regarding the results of this case study, indicating that the information system administrator influences information use, might be that information system administrators can affect other influencing factors. Thus, they too may influence the use of information.

Credibility, or confidence in the Medicus system and the resultant information, was another factor found to influence use of patient classification information. This factor is discussed at length in the patient classification literature (Alward, 1983; Ballard et al., 1993; Chagnon et al., 1977; Curtin, 1984, 1986; Ebener, 1985; Edwardson, 1985; Finnigan, 1994; Giovannetti, 1985; Giovannetti & Mayer, 1984; Lawson et al., 1993; Noyes, 1994; Prescott, 1986; Salmen et al., 1986; Serote, 1984; Sovie et al., 1985; Staley & Luciano, 1984; Tilquin, 1977; Vanderzee & Glusko, 1984). Additionally, findings from the only published research regarding use of patient classification information indicate that "PCS information was more extensively used when the system was considered reliable and valid" (Krause, 1988, p. 195). Krause acknowledged the difference between

belief in the reliability and validity of the system and actual reliability and validity. This distinction is important, and will be discussed later in this chapter. Research published in the organizational decision making literature indicates that the perceived quality of information influences, though is not a strong predictor of, information use (O'Reilly, 1982). O'Reilly examined variations in the use of four information sources. Frequency of use of three of the four sources was explained by accessibility rather than perceived quality. Only the use of the source easily accessible to all users was influenced by perceived quality. Williams and Bank (1994) found that information use is influenced by users' perceptions of the validity of information. The findings from this organizational case study suggest that credibility influences patient classification information use. However, there are occasions when people use the information even though they do not consider it to be credible. These findings are consistent with O'Reilly's research suggesting that credibility is one of many interacting factors influencing the use of information.

Informants reported using patient classification information because it was the sole available quantitative information source regarding patient acuity and related nursing care needs. The patient classification literature encourages the use of patient classification information

based on the premise that the information is unique and not available from other information sources. However, the impact of a sole information source on use is not addressed. Availability of information is recognized as a factor influencing information use in the organizational decision making literature (Sproull & Zubrow, 1981). Specifically, bounded rationality models of organizational decision making acknowledge the restraints of limited information (Browne, 1993; March, 1997). Research presented in the literature reflects a focus on access rather than availability. These studies reflect that access influences the use of information (O'Reilly, 1982; Sproull & Zubrow, 1981), and were mentioned in a previous section. In this case study informants distinguished between access and availability. Access refers to the ease of or difficulty obtaining patient classification information within the organization, and availability is the ability to obtain similar types of information from alternate sources. While both bodies of literature assume the importance of availability, this factor has not received significant attention. This study supports the influence of information availability as described in the bounded rationality models.

The vast majority of factors identified in this research as influences on the use of information in decision making have been discussed in the literature regarding patient classification or organizational decision making.

Some of the factors identified in this study, such as expectations of supervisors and subordinates, staff opinion, time involved in using the information, and scope of responsibility, were consistent with factors theorized to influence use. However, this research is the first to support these factors as influences on information use.

Two factors that emerged from this study, unit characteristics and familiarity, were not described in either the PCS or organizational decision making literature. Characteristics of a nursing unit such as patient population and unit design may be considered to be components of a decision situation. From this perspective, characteristics of a nursing unit would be expected to influence information use (Majchrzak, 1986). Further study of these factors is warranted.

There is one major difference in the findings from this study and the influences on information use described in the patient classification literature. Validity and reliability of patient classification tools and systems are discussed extensively and are considered to be significant factors influencing the use of information generated by PCSs (DeGroot, 1994a; Finnigan, 1994; Groves, 1994; Strickland & Neely, 1995). However, findings from this case study do not reflect that actual validity and reliability of the patient classification instrument or system are influencing factors. While informants mentioned validity and reliability, these

did not emerge as factors influencing the use of patient classification information. Credibility, or confidence in the system and the patient classification information, was however, identified as an influencing factor. Thus, perceptions of the system and resultant information influenced information use, while actual validity and reliability did not. This finding contrasts significantly with assumptions in the patient classification literature regarding the influence of validity and reliability on the use of information.

Twenty-one factors influencing the use of patient classification information emerged from analysis of the data obtained during this organizational case study. These factors influence use of information generated by a PCS. The findings of this study revealed that relationships clearly exist between these factors and how information is used in this organization. However, the examination of the direction, intensity, and interaction of these relationships was beyond the scope of this research and requires further study.

## Implications

The findings from this organizational case study provide insight into the use of patient classification information and thus have significance for administrators and information systems vendors. Additionally, results generated from this research have implications for the

developing body of theory regarding the use of information in organizational decision making.

## Administrators

Automated PCSs are widely used in acute care settings throughout the United States (DeGroot, 1994a). The intended purpose of these systems is to generate information to be used in decision making by and for nurses and nursing services (Hannah et al., 1994). Administrators expend considerable resources to purchase and maintain this type of information technology. Clearly, expenditures for PCSs are expected to result in the use of information generated by these systems to improve decision making.

The findings from this study suggest a number of implications for nurse administrators. Continuing changes in the health care environment have caused many administrators to wonder whether PCSs will have value in the future. Findings from this case study suggest that uses for information generated by patient classification information systems will continue to evolve. Plans for future use described by informants in this study suggest that nurse administrators should look beyond the traditional uses of PCSs and creatively use PCS information in combination with other available information. For example, collaborating with other departments such as finance and information systems may result in uses of this information that can positively influence patient outcomes as well as the financial status

of a hospital.

Understanding the multiple ways in which information generated by PCSs is used may suggest applications previously not considered. Additionally, insight regarding the use of information can assist nurse administrators to educate managers, staff and other administrators about the potential uses and value of patient classification information. Knowledge of the ways in which this information is used and not used could also provide insight and a framework for nurse administrators interested in assessing patient classification information use in their organization.

Nurse administrators can also benefit from understanding that people use patient classification information differently. Knowledge that information use varies within and between groups and departments has implications for system implementation as well as for monitoring information use. For example, an assessment of actual or planned information uses would be incomplete, and would likely lead to erroneous conclusions, if multiple users from various personnel groups and units or departments were not queried.

The finding regarding the use of patient classification information as one type of information used in decision making also has implications for nurse administrators. Even those individuals who valued patient classification

information and used it frequently reported that they used other information as well. Thus, the use of additional information sources, such as nursing knowledge, must be recognized and included in education regarding the use of PCSs. Another implication is the need for nurse administrators to assure availability of additional sources of quality information.

Nurse administrators can also utilize knowledge regarding patterns of patient classification information use. Understanding that patterns of information use exist and are developed over time has a number of implications. For example, a nurse administrator new to an organization would benefit from understanding patterns of information use in that organization. Additionally, nurse administrators desiring a change in patient classification information use, could consciously attempt to influence these patterns. This also suggests the importance of the findings regarding the factors that influence information.

Nurse administrators can benefit from knowing about factors that influence the use of patient classification information. Insight regarding these factors enhances the ability of nurse administrators to identify opportunities to increase the use of patient classification information. For example, the findings from this research could be used as a framework to assess factors influencing the use of information within an organization. These factors also

provide a basis for developing strategies to influence use of information generated by PCSs. For example, since the findings from this research suggest that strategies related to system operations influence the use of information, nurse administrators would be wise to focus on establishing processes to get patient classification information to potential users within a time frame that accommodates their needs and could assist them to achieve their goals. Since relevant information influences use, nurse administrators determined to have patient classification information used as a component of decision making regarding staffing might consider having patients classified more frequently or updating staffing recommendations based upon the actual census at least three times a day. Results from this study also suggest the use of strategies focused on educating staff, managers and administrators about the PCS and the ways in which the information could be used. Nurse administrators might also wish to focus on developing strategies to increase the credibility of patient classification information. Establishing clear expectations and rewards for the use of information generated by a PCS is another strategy supported by this research. These are just a few examples of the strategies that could be initiated. Nurse administrators who understand the factors identified in this research have the opportunity to develop many additional strategies to increase the use of patient

classification information.

While important, daily operations are not the only area of responsibility for nurse administrators. Implications of the findings from this case study suggest continuing opportunities for research. Nurse administrators would be well advised to use available patient classification information as a component of research. Additionally, further study of the factors that influence use of the information generated by these systems is warranted. Research regarding the costs and benefits of these systems is essential as well. For example, while the actual cost of purchasing PCSs is known, no empirical data exist regarding the impact of use, or non-use, of PCS information on cost per patient day. Studies exploring the relationships between patient classification information use and the cost and quality of care would provide valuable information for nurse administrators.

## Information System Vendors

Nursing information systems continue to be developed, marketed and sold to health care organizations throughout the United States (DeGroot, 1994a). The intended purpose of these systems is to provide nurses with information to use in decision making (Hannah et al., 1994). The results of this organizational case study suggest a number of implications related to the design, marketing, and implementation of nursing systems.

Administrators in this study plan to use patient classification information in the future in conjunction with information generated by other information systems. Specifically, administrators want to link patient outcomes, cost of care and quality measurement. Vendors would thus be wise to develop nursing information systems that interface easily with other information systems typically used in health care organizations. Systems currently under development, as well as system upgrades, will need to address outcomes, cost and quality. The addition of these features will be seen as desirable. However, the findings from this study suggest that system upgrades must be accomplished while still providing information that can be used for more traditional purposes.

Understanding the actual use of information generated by PCSs can assist information system vendors to market their products. For example, the most frequently reported use of information in this study was for justifying requests or decisions. Describing how information generated by their system will help nurses justify their requests of decisions may assist with sales. Knowledge regarding the most frequently described uses such as: verifying judgements, managing/budgeting FTEs, analyzing trends, and determining staffing, could also be used by vendors to develop marketing strategies. Recognizing that some nurses use patient classification information to defend positions would also be

useful. On the other hand, knowing that some nurses use the information to determine the accuracy of the information generated by PCSs could be important in terms of the credibility of the system. Since one of the factors influencing use was credibility, showing nurses that the information generated from the system is "accurate" because it reflects their judgement would be a useful sales technique. Additionally, vendors in the role of consultant could use this strategy to influence use of the information once the system has been purchased.

Vendors might also find it useful to realize that not all individuals with access to the information generated by a PCS will use the information. This knowledge might stimulate vendors to further explore factors that influence use. This could be particularly helpful in addressing potential issues regarding non-use or under-use that are identified during the sale or implementation of their systems.

Similarly, understanding that people in organizations use the information differently could be helpful when marketing or implementing a PCS. Recognizing the needs of different target audiences might help vendors design the systems to meet the needs of different groups. Additionally, presentations and educational offerings could be developed to meet the needs of specific individuals, groups, units, divisions, or departments.

Recognition that patient classification information is used in consistent patterns might also be useful for vendors. Determining what rules exist in an organization in regard to use of patient classification information could assist vendors in developing sales presentations, educational offerings, and consulting services.

Vendors who understand that patient classification information is not exclusively used in decision processes may benefit by designing products to interface with other information systems. Recognizing that sources other than information systems are used to obtain information for decision making may also be useful for vendors when designing and marketing products. The use of clinical wisdom by nurses is one example. Presentations could be tailored to emphasize the use of other information that is valued in the organization in conjunction with patient classification information.

Understanding the factors that influence use of information generated by PCSs can also assist vendors to design, sell, and implement systems. For example, knowledge of the influence of operational processes and access on the use of information, would lead vendors to design systems that provide information that is timely, relevant and accessible. Additionally, these attributes could be used to help market the system. Once purchased, an understanding of these particular influences would lead vendors to work with

organizations to implement procedures that: resulted in information being returned to the unit in a timely manner; provided relevant up-to-date information; and, was easily accessible to all nurses who could potentially use the information. Another valuable use of knowledge regarding factors that influence use of information would be for consulting purposes. An organizational analysis of information use could be conducted using these factors as a framework for problem identification and resolution. Such a framework might also be useful for vendors as they design and evaluate new products.

## Theory development

The organizational decision making literature supports the notion of information as an important component of decision making. However, the role of information in the decision making process is not yet well understood. Theories regarding the use of information in decision making continue to be generated, and presently no fully articulated model linking information and the use of information within the decision process exists.

Multiple uses of patient classification information were identified in this case study. Six categories relating to how this information is used emerged during data analysis. The uses of patient classification information described in this study are not consistent with a single model of organizational decision making, but rather reflect

various models. The same is true of the 21 factors that were described as influencing the use of patient classification information. No one model accounts for all of the influencing factors. Thus, these research findings support the view that the multiple perspectives of decision processes in organizations are not independent of each other (Browne, 1993). Instead, aspects of all models may be correct (Enderud, 1980; March, 1997). The findings from this study support the development of a model of information use in organizational decision making that weaves the various models together in such a way that allows each perspective to illuminate others (March, 1997).

Findings from this research also suggest that uses for patient classification information are expected to continue evolving. Current models of organizational decision making do not address the evolution of information uses over time. Thus, extension of future models to include evolutionary changes in the use of information may be warranted.

Nine propositional statements regarding the use of patient classification information in organizational decision making emerged from this research (Table 6). The context of these propositional statements is the use of information generated by a particular PCS (Medicus) within a university teaching hospital. Thus, while these statements may describe the use of PCS generated information in other hospitals, it would be inappropriate to make such an

Table 6.

Propositions: Use of PCS Information in Decision Making

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Proposition 1: PCS information use is expected to continue evolving in the future.

Proposition 2: PCS information is used in multiple ways.

Proposition 3: PCS information is used by registered nurses at all organizational levels, as well as administrators in other departments.

Proposition 4: PCS information is used in different ways at different times.

Proposition 5: PCS information is not necessarily used even if available.

Proposition 6: PCS information is used differently within and between personnel groups, units, clinical divisions, and departments.

Proposition 7: When PCS information is used, it is used in consistent patterns.

Proposition 8: PCS information is not the sole information source used for decision making.

Proposition 9: PCS information use is influenced by one or more factors.

inference based upon the data obtained in this organizational case study. Statistical generalization is not possible because the study was conducted in a single organization. Additionally, there are different versions of the Medicus system, as well as a considerable number of other PCSs used in hospitals across the United States. The findings of this case study may, however, be used for theoretical generalizations. These propositions were induced from the data and may be used as a basis for further work toward the development of a theoretical framework of information use in organizational decision making.

## Future Research

A model accounting for all variables relevant to the use of information in decision making has not yet been developed. Thus, further research is warranted. The findings from this organizational case study support the use of multiple models to understand the use of information in decision making. This emphasizes the importance of using research approaches that allow for the use of information in decision making to be examined from many perspectives. Additionally, the findings from this study suggest the need to continue conducting research in a way that is holistic and takes place in a real-life context. This does not preclude the use of quantitative methods, however, these methods alone cannot provide the richness of data necessary for understanding the complexity of information use in

organizational decision making.

The findings from this organizational case study give rise to four specific recommendations for future research. This research resulted in a description of how and why information generated by a PCS is used in one organization. Additionally, nine propositions emerged from the data analysis. These propositions may be used as a framework for future research. The categories and subcategories regarding information use provide a basis for the development of a questionnaire that could be used for a multi-organizational case study. A combination of quantitative and qualitative methods would provide the opportunity to take advantage of the benefits of both methods to expand our understanding of information use in decision making. Initial studies might focus on the use of patient classification information in decision making. The focus could be expanded or changed in the future to include management information generated by other nursing information systems.

Identification of factors that influence the use of patient classification information was also a result of this study. Further study of these factors is essential. This study identified the existence of a relationship between influencing factors and information use. However, further research is needed to explore the direction, intensity and interaction of these relationships.

Secondary analysis of the data collected for this case

study is also warranted. Some of the uses of patient classification information described in this study do not fit neatly within current organizational decision making models. For example, the use of PCS information to determine the accuracy of the information generated by the system is not a type of use reflected by any model. Browne (1992) suggests thinking "not of use of information, but of the uses to which information is put" (p. 42). Five kinds of information use are described in a "rudimentary typology of use" (p. 43) that emerged from research on information use in decision making: conceptual; instrumental; tactical; symbolic; and, political. Browne's work was conducted at the highest level of organizations, while this organizational case study involved informants representing all levels of management. Use of the typology to analyze existing data from this study would contribute to understanding information use in organizational decision making.

Another opportunity for research involves the analysis of additional data collected during this study. As expected, a significant amount of data were collected during the interview process that was not directly related to the research questions in this organizational case study. This rich data relates to the experience of having a PCS in place in an organization. Analysis of those data would result in learning about the experiences of having a PCS from the perspectives of staff, managers and administrators.

Additionally, the analysis could provide insight regarding the choice to have and maintain a PCS and the issues associated with maintaining system integrity.

## Summary

The purpose of this study was to describe how and why PCS information is used in hospital decision making. One of the outcomes of this research was the interpretive description of the use of this information. Seven categories relating to how and why patient classification information is used in hospital decision making emerged from analysis of the data. Six categories pertain to how patient classification information is used in decision making. One category relates to why PCS information is used, or not used, in decision making.

Findings were compared to theory and research in the patient classification and organizational decision making literature. The majority of the findings from this study are consistent with the literature. One such finding is particularly important. The results from this study support the theory that multiple perspectives of information use in organizational decision making are necessary to reflect this complex process. Additionally, the findings are consistent with previous research regarding the different uses of information by individuals throughout the organization. The consistent patterns of information use found in this study also support the relatively new theory of decision making as

rule-following (March, 1997). The majority of factors influencing the use of information identified in this research are also consistent with those described in the patient classification and organizational decision making literature. While most of the findings from this study have previously been mentioned in the literature, some of the uses and influences were inferred and not explicitly stated. Additionally, findings from this case study provide the first research evidence regarding the influence of some factors.

Several recommendations for nurse administrators and PCS vendors resulted from this study. Additionally, the findings from this research suggest implications for theory development. Development of a model of information use in organizational decision making that incorporates the various existing perspectives was supported by this research. The extension of future models to include evolutionary changes of information use over time is also a recommendation based upon findings from this case study. Further work toward a theoretical framework of information use in organizational decision making may also be facilitated by the nine propositions induced from the case study data.

Research focusing on the use of patient classification information use in decision making benefits nurse administrators and vendors of PCSs. An understanding of actual and planned uses provides opportunities for PCS

development and implementation to meet current and future needs. Knowledge regarding the factors that influence use of patient classification information is particularly important for nurse administrators. A system that is not used is an expense without benefit. Strategies to influence the use of information may be designed using the factors identified in this research. Further research regarding the relationships between influencing factors and information use will benefit administrators. Additionally, research in this area will contribute to the body of knowledge regarding the uses of information in organizational decision making.

# Appendix A

## Sources of Data

| | |
|---|---|
| Documentation: | Letters, memos, meeting minutes, written reports, proposals. |
| Archival records: | Service records (staffing sheets), organizational records (organizational charts, budgets, assignment sheets), lists (of names). |
| Interviews: | Formal semi-structured, formal and informal focused, informal unstructured. |
| Direct observation: | Shift-to-shift report, observation of decision situations (staffing, patient assignments). |
| Physical artifacts: | Computer printouts generated by Medicus PCS. |

# Appendix B

## Goals for Initial Interview with Nurse Executive

1. Identify which nursing units collect data for input into Medicus PCS (also obtain names of nurse managers).
2. Determine other individuals (in the department and in the hospital) who use the information to make decisions.
3. Determine those individuals who may use or influence the use of Medicus generated information (department and hospital personnel).
4. Identify the individual(s) responsible for managing the Medicus PCS (and their roles).
5. Identify situations in which the use of Medicus information to make decisions is reported, discussed, or demonstrated.
6. Identify the existence and location of documents that reflect the potential or actual use of Medicus information in decision making.
7. Ascertain suggested methods of accessing identified individuals (informants), situations, and documents.

# Appendix C

## Semi-structured Interview Questions

### Part 1: Demographic Data

Today's Date

Place

Time

Informant's name

Gender

Age (optional)

Race (optional)

Culture (optional)

Current job title

Department/unit

Number of years in current position

Number years at hospital

List all diplomas and degrees (post high school)

State and country of schools (high school and beyond)

Type of licensure (if applicable)

Year of licensure (if applicable)

Type of certification (if applicable)

Year of original certification (if applicable)

# Appendix D

## Semi-Structured Interview Questions

### Part 2: General Topics

1. Describe how you became familiar with (learned about) PCSs.
2. In what ways can PCS information be used?
3. Describe how you became familiar with (learned about) the Medicus PCS.
4. In what ways is the information generated from the Medicus PCS used here?
5. Describe your involvement with the Medicus PCS.
6. Do you use the information generated from the Medicus PCS? If so, describe how you use the information.
7. Describe why you use the information for certain decisions. (Ask to specify which decisions).
8. Describe why you don't use the information for certain decisions. (Ask to specify which decisions).
9. What is the difference, if any, between the ways you use the information and others use the information? (Help identify "others" if necessary: CEO, etc.).
10. Describe why you don't use the information in the way that others do. (If applicable)
11. Tell me other ways that Medicus PCS information could be used at the hospital?
12. Why do you think the information is not currently used for these purposes?
13. How accurately does the Medicus PCS quantify the amount of nursing care a patient requires?
14. How did you reach this conclusion?
15. Tell me anything about the use of PCS information in decision making that I have missed or that you would like to tell me about.

Appendix E

University of Pennsylvania Human Subjects Review Committee Approval Letter

*INTRAMURAL CORRESPONDENCE*

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**Office of Research Administration**
**Suite 300, 133 S. 36th Street/3246**
**COMMITTEE ON STUDIES INVOLVING HUMAN BEINGS**
**Multiple Project Assurance #M1025**
**215-898-2614**

**Re: Protocol Title: Nursing Informatics And Hospital Decision Making: The Use Of Information Generated By An Automated Patient Classification System**
**Sponsor: In-House**

**Protocol # 1805 - 0**

**Dear Ms. Botter:**

**The Committee on Studies Involving Human Beings has reviewed and approved the revisions to the above-referenced protocol. Full approval has now been given to both the protocol and consent form. Work may begin at any time.**

**Please take note of the following additional information:**

**Adverse Reactions: If any untoward incidents or adverse reactions should develop as a result of this study, you are required to notify the Associate Director for Regulatory Affairs immediately. If the problem is serious, approval may be withdrawn pending further review by the Committee.**

**Amendments: If you wish to change any aspect of this study, such as procedures, the consent forms, or the investigators, please communicate your requested changes in writing to the Associate Director for Regulatory Affairs. The new procedures cannot be initiated until Committee approval has been given.**

**Reapproval: It is the investigator's responsibility to apply for reapproval of ongoing research at least annually, or more often if required by the funding agency. Forms are available from the Office of Research Administration.**

**Completion of Study: Please notify the Associate Director for Regulatory Affairs as soon as the research has been completed. Study records, including full protocols and signed consent forms (originals) for each subject, must be kept in a secured location by the investigator for three years following the study's completion. Studies under FDA jurisdiction are subject to FDA mandates regarding record retention.**

**Thank you for your cooperation with the Committee.**

**Sincerely,**

[redacted]

**Ruth Clark, Associate Director for Regulatory Affairs**

PENN

Appendix F

Medical Center Human Subjects Review Committee
Approval Letter

**Clinical Investigation Committee**

P.O. Box
Pennsylvania
5687

July 14, 1995

Mary L. Botter, M.S.N., R.N.
[redacted]
Middlebury, Vermont [redacted]

Re: CIC Protocol No. 95-113EP - Nursing Informatics and Hospital Decision Making: The Use of Information Generated by An Automated Patient Classification System

Dear Ms. Botter:

The Clinical Investigation Committee has reviewed the protocol for the above investigation and granted approval for a one year period effective **June 16, 1995**, the official date of approval, for a total enrollment of 50 subjects. Consent form changes recommended by the Committee have been completed. You may proceed using the consent form dated 6-16-95.

Please include the CIC protocol number on all future correspondence and documents related to this investigation.

All original, signed consent forms for this research must be forwarded to the CIC office, to be held in the central files. Please insure that each page of the consent form is signed and dated by an approved investigator and the patient/volunteer. A copy of the consent form must be given to the participant, and for patients place a copy in their medical record.

Federal regulations require prompt reporting to the CIC of any proposed changes in a research activity and prior approval before changes are initiated, except where necessary to eliminate apparent immediate hazards to the subject. Any adverse events related to this project should be reported to the CIC immediately.

The Clinical Investigation Committee appreciates your efforts to conduct research in compliance with the federal regulations that have been established to ensure the protection of human subjects.

Sincerely,

[redacted] M.D., Ph.D.,
CIC Chairman

\cnm

# Appendix G

## Consent Form

PROTOCOL #95-113EP
DATE 6/16/95

CONSENT FOR CLINICAL RESEARCH STUDY

Medical Center

Title of Project: Nursing Informatics and Hospital Decision Making: The Use Of Information Generated By An Automated Patient Classification System

Principal Investigator: Mary L. Botter, M.S.N., R.N.

This is to certify that I, _____, have been given the following information with respect to my participation as a volunteer in a program of investigation under the supervision of Mary L. Botter.

1. Purpose of the Study: This study is being conducted to investigate the use of patient classification information in hospital decision making.

2. Procedures to be Followed: I have been asked to answer questions relevant to the research, including demographic information, during one or more audiotaped interviews.

3. Discomforts and Risks: The only risks associated with my participation are associated with possible stress in answering the questions. There are no known injuries or complications that could arise as a result of participating in this study.

4. Benefits to Me: Participation will result in no direct benefits to me. However, I may gain additional knowledge or insight related to the patient classification system.

5. Alternate Procedures: I may decline to participate in this study.

6. Time Duration of the Procedures and Study: The audiotaped interview will last approximately 60-90 minutes. I may be asked to participate in more than one interview, but am under no obligation to do so.

7. Statement of Confidentiality: All records associated with my participation in the study will be subject to the usual confidentiality standard applicable to medical records, and in the event of any publication resulting from the research no personally identifiable information will be disclosed. Excerpts of this interview may be made part of the final research report, but under no circumstances will my name or identifying characteristics be included in this report. The true name of the organization will remain confidential as well. Only pseudonyms will be used for persons and places.

_____ _____

Volunteer's Signature Date Investigator's Signature Date

8. Right to Ask Questions:

   a. I may contact Mary L. Botter at [redacted] or (215) [redacted] if I have any questions regarding the study. I understand that if I wish further information regarding my rights as a research subject, I may contact the Research Compliance Coordinator at the Medical Center by telephoning

   b. I have been given an opportunity to ask any questions I may have and all such questions or inquiries have been answered to my satisfaction.

9. Compensation: There is no financial cost to me associated with my participation in the study and I will receive no payment for my participation in this study.

10. Voluntary Participation: My participation is voluntary. I further understand that I may withdraw from this study at any time. My withdrawal from this study or my refusal to participate will in no way effect my job.

This is to certify that I consent to and give permission of my participation as a volunteer in this program of investigation. I understand that I will receive a signed copy of this consent form. I have read this form, and understand the content of this consent form.

| Printed Name of Participant | Signature of Participant | Date |
|---|---|---|

I, the undersigned, have defined and explained the studies involved to the above volunteer.

| Printed Name of Investigator | Signature of Investigator | Date |
|---|---|---|

PROTOCOL #95-113EP
DATE 6/16/95

STATEMENT OF NON-COERCION

Medical Center

I certify that I freely consent without coercion to volunteer for the investigational research study entitled Nursing Informatics and Hospital Decision Making: The Use Of Information Generated By An Automated Patient Classification System, which is currently being conducted in the Department of Nursing by the following investigator: Mary L. Botter, M.S.N., R.N.

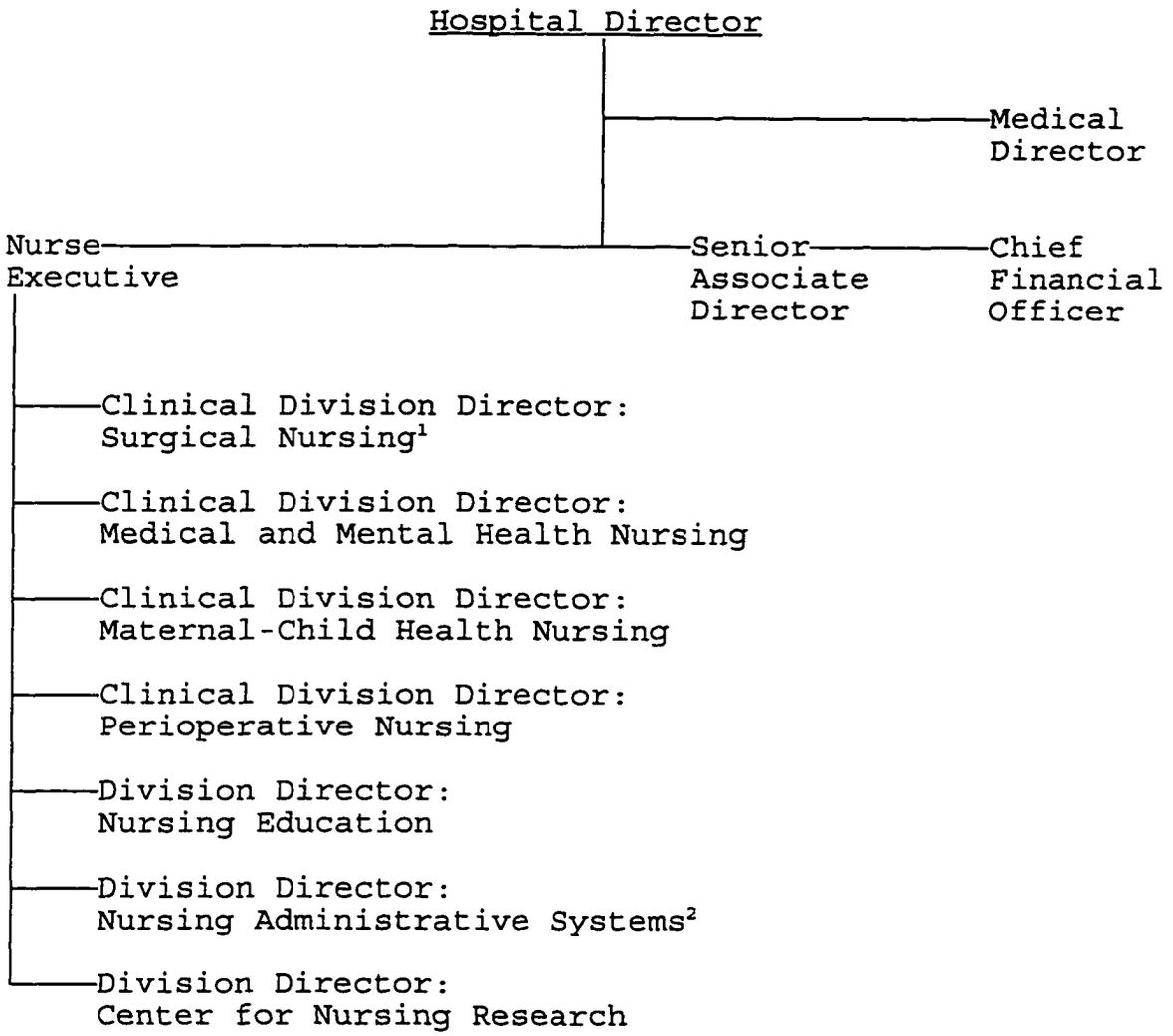
I acknowledge that no member of my department, including the investigator, chairman, or any other members of Medical Center have coerced or intimidated me into this decision. My participation in, or possible withdrawal from, this study will be kept confidential insofar as possible.

_____
Volunteer's Signature

_____
Date

Appendix H

Organizational Chart: The Medical Center




[1] Seven months after the study began, this Clinical Division Director assumed responsibility for the Division of Nursing Administrative Services.

[2] Seven months after the study began, this division director position was eliminated. The Clinical Division Director: Surgical Services assumed responsibility for the Medicus PCS.

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