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Registered nurse individual innovative behavior, research utilization, and the quality and safety of patient care

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Registered Nurse Individual Innovative Behavior, Research Utilization and the Quality and Safety of Patient Care

by

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DISSERTATION

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ABSTRACT

Registered Nurse Individual Innovative Behavior, Research Utilization, and the Quality and Safety of Patient Care

by

Jose J. Dy Bunpin III

The Institute of Medicine (IOM), in a report on the future of nursing, recommends nurses to be innovative in research, education, and practice in order "to lead and diffuse collaborative improvement efforts" (2010a, pp. S-9). Government agencies, healthcare groups, policymakers, researchers, and administrators emphasize the importance of innovation, research utilization, and the quality and safety of patient care. However, little is known about the individual innovative behaviors of registered nurses and the relationships between individual innovative behavior, research utilization, and the quality and safety of patient care are poorly understood. This study described acute care registered nurse individual innovative behavior using a descriptive, cross-sectional research design. Questionnaires, available both in paper and on-line formats, were distributed to registered nurses. In addition, this study explored the relationships of antecedent variables (autonomy, leader-member exchange, support for innovation), individual innovative behavior, and research utilization. It was found that nurses had, on average, moderate individual innovative behavior as well as moderate commitment to research utilization. Individual innovative behavior was predicted by autonomy, specialty certification, and belief suspension. Research utilization was predicted by individual innovative behavior, attitude towards research, and in-services and continuing education. Perceived high quality of patient care was predicted by support for innovation and working in critical care areas. Perceived high safety of patient care was predicted by autonomy, support for innovation, and age. Individual innovative behavior and

research utilization were not significant predictors of the perceived quality or safety of patient care but may be mediating variables between some of the antecedent variables and the quality and safety of patient care.

Keywords: individual innovative behavior, research utilization, autonomy, leader-member exchange, support for innovation, perceived quality and safety of patient care

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CHAPTER 1

INTRODUCTION TO THE STUDY

The Institute of Medicine (IOM), in a report on the future of nursing, recommended that nurses should be innovative in research, education, and practice in order "to lead and diffuse collaborative improvement efforts" (IOM, 2010a, pp. S-9). The report recognized the role of nurses in improving research utilization and the quality and safety of patient care. The IOM's emphasis on the role of nursing is well placed as other stakeholders also see the value of nurses in transforming healthcare. Government agencies, healthcare groups, policymakers, researchers, and administrators also emphasized the importance of innovation, as well as research utilization, in improving the quality and safety of patient care (Agency for Healthcare Research and Quality [AHRQ], 2010; Estabrooks, 2009; International Council of Nurses [ICN], 2010; IOM, 2010b; Landrigan et al., 2010). These emphases are for several reasons. First, innovation - an idea, practice, or object that is perceived as new by an individual or other unit of adoption, such as electronic health records - is seen as one of the solutions to improving quality and safety of patient care (Geibert, 2006; ICN, 2010; Rogers, 2003). Innovations are adopted through a process called individual innovative behavior and this process is necessary for uptake (S. G. Scott & Bruce, 1994b). Second, research utilization, which is the application of research findings to clinical practice, is also seen as a solution to improving the quality and safety of patient care (Estabrooks et al., 2008). New research findings are considered as innovations in healthcare (Clarke et al., 2005; Crimlisk, Johnstone, & Sanchez, 2009). Nursing practices should change as new evidence found through research is implemented at the bedside. Third, quality and safety of patient care remain a challenge in healthcare despite continuing efforts for improvement (AHRQ, 2009; Landrigan et al., 2010). Despite emphasis of these three attributes, little is known about

individual innovative behavior among registered nurses, research utilization remains under-adopted, and the quality and safety of patient care continue to need improvement (AHRQ, 2009; Berwick, 2003; Chang & Liu, 2008; Estabrooks, 2009; IOM, 2010a; Knol & Van Linge, 2009; Landrigan et al., 2010; Salge & Vera, 2009).

Individual innovative behavior and research utilization were the substantive foci of this study because of the emphasis placed on them by key stakeholders. The main goal of this project was to understand individual innovative behavior among registered nurses working in acute care hospitals. Individual innovative behavior in nursing merited exploration because of the potential benefits in accelerating and increasing the uptake of innovations, improving service delivery and decreasing costs. This project also sought to understand relationships between antecedent variables (autonomy, leader-member exchange and support for innovation), individual innovative behavior, research utilization, and the quality and safety of patient care. The central role that nurses play in the care of patients positions them to identify, promote, and implement new ideas in their clinical practice (Kim, Capezuti, Boltz, & Fairchild, 2009). Leaders and policymakers also consider individual innovative behavior important because it can result in improved organizational outcomes (Salge & Vera, 2009; Yuan & Woodman, 2010), including the quality and safety of patient care in hospitals.

The purpose of this chapter is to provide the background and significance for the study between individual innovative behavior, research utilization, and the quality and safety of patient care among registered nurses. This chapter is organized as follows: 1) the statement of the problem, 2) purpose of the study, 3) specific aims and research hypothesis, 4) a brief description of the research design, 5) the variables included in this study, and 6) a summary.

Statement of the Problem

The IOM (2010) report on the future of nursing called for the transformation of nursing at the practice, research, and education levels. Nurses, however, are faced with multiple obstacles in developing, adopting, and implementing novel clinical care because of the bureaucratic structure of the U.S. healthcare system (IOM 2010a; Rutledge & Donaldson, 1995). Whereas individual innovative behavior has been studied in business with particular focus on Research and Development (R&D), Information Technology (IT), and other knowledge-intensive and service industries (De Jong & Kemp, 2003; Janssen, 2001; Sanders, Moorkamp, Torka, Groeneveld, & Groeneveld, 2010; S. G. Scott & Bruce, 1994a). The behavior has not been studied to the same extent in nursing. However, nursing is also a knowledge-intensive service profession and individual innovative behavior may be of value in efforts to ensure patient care is safe and of the highest quality (R. G. Hughes, 2008; Kurtzman & Corrigan, 2007). Knowledge gained from clinical experience and knowledge specific to a particular clinical area or patient population should be constantly applied in nurses' clinical practice (S. Scott & Pollock, 2008; Taylor, 1997). However, studies indicate that registered nurses value research knowledge, but do not give it as much weight as experiential knowledge (S. D. Scott, Estabrooks, Allen, & Pollock, 2008). There is an assumption that nurses practice individual innovative behavior (Chang & Liu, 2008; Knol & Van Linge, 2009), but this assumption has not been empirically tested. Because studies of individual innovative behavior among registered nurses are limited, lack of information makes the management of the behavior difficult. In theory, individual innovative behavior should lead to increased innovations (Rogers, 2003; S. G. Scott & Bruce, 1994b).

Additionally, research utilization is identified as one crucial aspect of the work of nurses, is identified by the IOM (2010a) as a priority, and is seen as a tool to improve the quality and

safety of patient care (Estabrooks, 2009). Nurses are expected to adopt research findings into their nursing practice (Coyle & Sokop, 1990; McCloskey, 2008; Rodgers, 2000). Registered nurses, especially, should embrace the role of research utilization in informing their practice to ensure the safest and highest quality patient care. Research evidence constantly shifts with the discovery of new findings and nurses should understand that accessing, assessing, implementing, and integrating research is part of the nurse's role (S. D. Scott et al., 2008). Registered nurses need to address new research evidence and process this information to generate, persuade and implement new ideas to improve patient care and outcomes. However, despite the importance of research utilization, slow and low uptake remains a problem among registered nurses (Estabrooks et al., 2008; Rodgers, 2000). Research utilization is a complex endeavor where multiple factors can either hinder or facilitate the adoption of new research findings. Previous studies have identified individual and organizational factors that had a significant impact on how quickly and readily research was utilized in clinical practice (Estabrooks, 2009; S. D. Scott et al., 2008).

The Agency for Healthcare Research and Quality (AHRQ) (2009), in a report, stated that the quality of patient care is improving, but remains suboptimal. A study on patient safety in U.S. hospitals found that significant improvement has not been achieved despite efforts to improve practices (Landrigan et al., 2010). The IOM continues to highlight the need for improvement in the quality and safety of patient care. The IOM (2010a) also recognizes the role of nurses as pivotal in the improvement efforts in our current healthcare system. Nurses are the largest labor force in healthcare and have been identified as an underutilized resource in improvement efforts (Eastaugh, 2007).

Purpose of the Study

The purpose of this study was to describe individual innovative behavior among registered nurses and discover if there was a relationship between individual innovative behavior, research utilization, and the quality and safety of patient care. Understanding the role of individual innovative behavior in research utilization may provide some guidance in increasing and accelerating the uptake of research in practice. This knowledge may help managers and administrators in promoting individual innovative behavior and supporting future practice, research, and education initiatives. Interventions could be designed to improve registered nurse individual innovative behavior and research utilization by determining the relationship among the variables in the study. Additionally, this study described research utilization, autonomy, leader-member exchange, support for innovation, and the quality and safety of patient care. Attitude towards research, belief suspension, and in-services and continuing education were included because of their consistent relationships with research utilization from previous studies. Demographic variables of age, clinical area, highest level of education, specialty certification and hospital size were also included because of their previous relationships with the major variables in the study. The conceptual framework shown in Figure 1 guided this study. This conceptual framework was based on the review of theories and literature on individual innovative behavior and is discussed in Chapter 2.

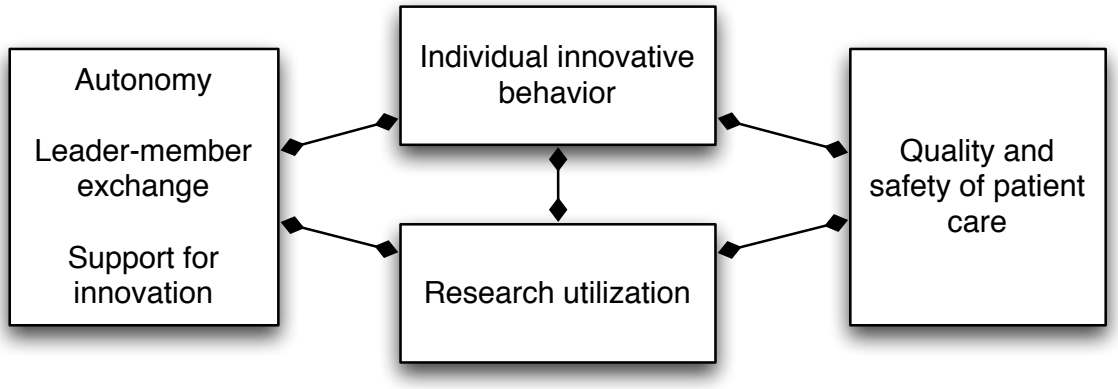

Figure 1. Antecedent variables, individual innovative behavior, research utilization, and the quality and safety of patient care.

Specific Aims

The specific aims of this study were to:

1. Describe individual innovative behavior, research utilization, autonomy, leader-member exchange quality, support for innovation, and the quality and safety of patient care (major variables) among registered nurses working in acute care hospitals.
2. Describe the relationships among the antecedent variables – autonomy, leader-member exchange, support for innovation –, individual innovative behavior and research utilization.
3. Describe the relationships among individual innovative behavior, research utilization, and the quality and safety of patient care.

Research Hypotheses

The research hypotheses for this study were as follows:

Hypothesis 1: Better autonomy, leader-member exchange quality, and support for innovation increase individual innovative behavior among registered nurses who work in acute care hospitals, controlling for covariates.

Hypothesis 2: Better individual innovative behavior increases research utilization among registered nurses who work in acute care hospitals after controlling for covariates.

Hypothesis 3: Better individual innovative behavior and research utilization increase the likelihood of perceived high quality of patient care.

Hypothesis 4: Better individual innovative behavior and research utilization increase the likelihood of perceived high safety of patient care.

Research Design

A descriptive, cross-sectional design was used for this study. Hospitals were initially selected based on the Health Information Management Systems Society (HIMSS) database (The Dorenfest Institute for H.I.T. Research and Education, 2010) and included only those hospitals that reported the extent of their electronic medical record (EMR) adoption. After initial recruitment efforts, the recruitment of hospitals was expanded to all acute care hospitals in California where the Chief Nurse Executive (CNE) or designee contact information was available. Registered nurses employed by the hospitals that agreed to participate in the study were then recruited through the CNE either through a form letter or through an email sent through the CNE or designee. Data were collected through a paper questionnaire with an option to answer the questionnaire through a web portal.

Variables in the Study

The major variables that were included in this study: (1) individual innovative behavior, (2) research utilization, (3) autonomy, (4) leader-member exchange, (5) support for innovation, (6) perceived quality, (7) perceived safety of care, (8) attitude towards research, (9) belief suspension, and (10) in-services and continuing education. These variables were measured using surveys previously used in other studies. Additional variables included (11) age, (12) years in

current position, (13) years as registered nurse, (14) gender, (15) role in organization, (16) level of education, (17) clinical area, (18) specialty certification, (19) employee status, (20) hospital size, and (21) hospital innovativeness. These variables are further discussed in Chapter 3.

Summary

Individual innovative behavior, research utilization, and the quality and safety of patient care are all currently emphasized in healthcare and need to be studied in order to increase our understanding of these concepts (AHRQ, 2010; IOM, 2010a; 2010b). Although individual innovative behavior has been studied in business the concept still needs exploration in nursing (Åmo, 2006; Janssen, 2005; S. G. Scott & Bruce, 1994b). Individual innovative behavior may be key to increasing and accelerating research utilization among registered nurses (Donaldson, Rutledge, & Ashley, 2004; Estabrooks, Midodzi, Cummings, & Wallin, 2007; Rogers, 2003). Despite these emphases the relationships among these concepts remains largely unexplored (S. D. Scott et al., 2008). Achieving improvements in quality depends on how organizations invest in their employees to carry out the organization's work (Gilmartin, 1999). The value of nurses in such efforts cannot be overemphasized, not just because of the large number of nurses, but also because of the close proximity of nurses to the patients they serve and in their direct role in ensuring the quality and safety of care.

This research project explored these relationships and added to the knowledge about the major variables. Understanding the process of individual innovative behavior among registered nurses may help hospitals plan focused strategies and interventions to increase and accelerate the uptake of research utilization, and provide the support needed by registered nurses to practice their profession, and help organizations achieve better performance. This study also addressed the assumption that nurses are innovative – which to date has little empirical evidence supporting

it – and provided the empirical evidence of individual innovative behavior among registered nurses.

This project is presented in four additional chapters. Chapter 2 reviews the theories and empirical literature that form the basis of this project. Chapter 3 describes the methodology that was utilized for the study. Chapter 4 provides the data analysis. Chapter 5 presents the findings, conclusions and implications.

CHAPTER 2

REVIEW OF THEORY AND RELATED LITERATURE

The literature on quality and safety of patient care often cites several IOM (2001, 2004) reports. IOM published these reports to highlight the major challenges that healthcare in the United States faces and to provide the impetus for healthcare providers to improve the delivery and outcome of patient care. Leading and diffusing improvement efforts in the delivery of care, such as through research utilization, requires change (Donaldson et al., 2004). Effective management of change within an organization is essential for the organization to successfully achieve its goals (Charles, 2000; Titler, 2010). Related to the management of change is the management of the innovation process (Cybulski, Zantinge, & Abbott-McNeil, 2006). The innovation process is a special type of change that entails the application of something new or novel whether a product, process, service, or system (AHRQ, 2010; Rogers, 2003). Individual innovative behavior has been identified as a key mechanism that leaders can foster in their efforts towards achieving better patient outcomes (Douglas & Ryman, 2003; S. G. Scott & Bruce, 1994b; Tarantino, 2005).

The process of change in organizations is complex and difficult and individuals are but one aspect of this complexity. The management of change must be done on all levels – individual, group, and organization (Hage, 1999; MacGuire, 1990). Nurses, the largest group of employees in the healthcare industry (Moore, 2008), have been largely underutilized in innovation activities but they have the collective potential to be an impetus for innovation and change in healthcare (Hoyt, 2006). Groups in hospitals can include multidisciplinary teams that include various occupations (e.g. physicians, registered nurses, nursing assistants) and the interaction process between these workers may also be complex (Plsek & Greenhalgh, 2001).

Understanding individual and group change processes is essential to successful organizational change (Lamm & Gordon, 2010). Theory is helpful in explaining and understanding complex processes and guiding research (Meleis, 2007). Reviewing the existing literature also assists in understanding the gaps in our knowledge.

The purpose of this chapter is to provide the theories and empirical literature that inform this study. This chapter is organized as follows: 1) the theories are discussed, critiqued, and summarized, 2) the empirical literature is presented and the gaps are enumerated, and 3) a summary and conceptual model is presented.

Theoretical Framework

The conceptual model that guided this study was drawn from three theories: (1) individual innovative behavior, (2) diffusion of innovations, and (3) the resource-based view of the firm. Scott and Bruce's (1994b) individual innovative behavior theory is useful in understanding the factors that affect the individual employee. Roger's (2003) work on the diffusion of innovations theory is helpful in understanding how individuals make decisions about innovations and how innovations spread though a group of people. The resource-based view of the firm (RBV) theory (J. Barney, 1991; Wernerfelt, 1984) is useful in understanding how resources affect organizational performance. However, each of these theories individually has shortcomings that limit their applicability for this study. The three theories were subsequently discussed and critiqued. Criteria from Chinn and Kramer (2004) were used to critique the theories.

Individual innovative behavior. The foundation of innovation is ideas. Without people to generate, develop, and implement ideas, innovation cannot happen (Van de Ven, 1986). Individual innovative behavior is a people-driven, multistage process that is composed of idea

generation, idea promotion, and idea realization (Chang & Liu, 2008; Knol & Van Linge, 2009; S. G. Scott & Bruce, 1994b). These stages are discontinuous activities and a combination of any of these activities can happen at any one time. Because of the people-driven nature of innovation it is critical to study individual innovative behavior (S. G. Scott & Bruce, 1994b).

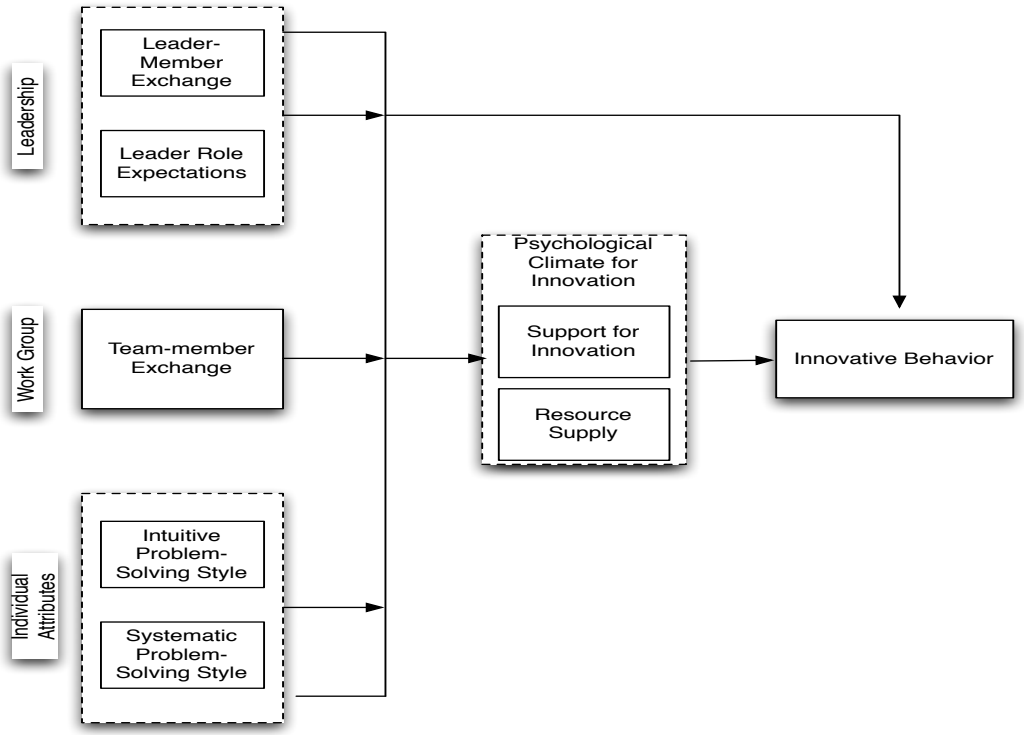

Figure 2. Individual innovative behavior[1].

The antecedents and motivators for individual innovative behavior, as identified by Scott and Bruce (1994b), are leadership, workgroup attributes, individual attributes, and psychological climate for innovation (see Figure 2). Leadership includes leader-member exchange and leader role expectations. Leader-member exchange is the interaction process between leaders and

[1] From "Determinants of innovative behavior: A path model of individual innovation in the workplace" by S. G. Scott and R. A. Bruce, 1994, *The Academy of Management Journal, 37*(3), p. 583. Copyright 1994 Academy of Management.

subordinates. Leader role expectations are the job expectations that leaders communicate to subordinates. Communication of expectations can be explicit or implicit or both. Work group attributes are represented by team-member exchange. Team-member exchange is a role-making process that occurs in a group of individuals who work together. High team-member exchange is characterized by mutual trust, respect, collaboration, and cooperation in a work group. Low team-member exchange is characterized by low levels of trust, respect, and collaboration in the work group (S. G. Scott & Bruce, 1994b).

Individual attributes in this model include two problem-solving styles, namely intuitive and systematic problem-solving styles. Problem-solving style is the cognitive ability of individuals to come up with solutions. Psychological climate for innovation is the information that individuals receive and process from the work environment about novel ideas. Psychological climate for innovation is represented by support for innovation and resource supply. The concept "support for innovation" is the help that organizations provide their employees to pursue new ideas (S. G. Scott & Bruce, 1998). Resource supply is the adequacy of materials that individuals need to perform their jobs (S. G. Scott & Bruce, 1994b).

There is the positive assumption that individual innovative behavior is good and desirable (Chang & Liu, 2008; Subramaniam, 2007), and that results from individual innovative behavior are also positive. Non-empirical nursing literature asserts that nurses are innovative, but empirical literature provides scant evidence of this assertion (Altun, 2008; IOM, 2010a; Porter-O'Grady, 2003). There are nursing studies that refer to individual innovative behavior as a concept but because it was not the main focus of the studies, they failed to describe the individual innovative behavior of nurses (Åmo, 2006; Chang & Liu, 2008; Knol & Van Linge, 2009). For example, in a study by Chang and Liu (2008) of Taiwanese public health nurses,

individual innovative behavior was used as an independent variable but an analysis of the concept was not included because the substantive focus of the study was employee empowerment.

Individual innovative behavior is not a complex theory and the concepts and relationships are not complicated (Carmeli, Meitar, & Weisberg, 2006; S. G. Scott & Bruce, 1994b). The concepts identified are clear and well defined (S. G. Scott & Bruce, 1994a, 1994b, 1998), and the theory has been used in several different studies in different sectors and has wide generality (Chang & Liu, 2008; Janssen, 2000; S. G. Scott & Bruce, 1994b; Yuan & Woodman, 2010). Different concepts of the theory are easily accessible using instruments that measure the concepts (S. G. Scott & Bruce, 1994b; Yuan & Woodman, 2010). The theory is important because it provides a perspective on how antecedent variables contribute to individual innovative behavior (S. G. Scott & Bruce, 1994a, 1994b, 1998). However, the theory does not provide an explanation for how innovation diffuses to different individuals within a group. Rogers' (2003) diffusion of innovation theory provides this perspective.

Rogers' diffusion of innovations. Rogers (2003) defined diffusion of innovations as "the process in which an innovation is communicated through certain channels over time among members of a social system" (p. 5). Rogers further described diffusion as a special type of communication because the message is about new ideas. He further added that diffusion brings about uncertainty and social change. Diffusion of innovations theory has four major elements: (1) the innovation, (2) the communication channels, (3) time, and (4) the social system. These four elements are discussed in the following section.

The first element of the theory identified by Rogers (2003) is the innovation itself. An innovation can be an idea, a practice, or a process that is considered as novel by any member of

the social system. Innovation attributes that are considered relevant to how successfully it is diffused are relative advantage, compatibility, complexity, trialability, and observability. Perception of whether an innovation is better than a previous idea is considered as its relative advantage. Compatibility is whether an innovation fits within the context of the potential adopters. Complexity is whether an innovation is easy or difficult to understand or implement by the adopters. Trialability is whether an innovation can be tried incrementally. Observability is whether the results of an innovation can be readily seen. Rogers (2003) posited that innovations that have high relative advantage, high compatibility, low complexity, are divisible for small trials, and have a high degree of observability would be adopted more quickly.

The second element of diffusion of innovations theory is the communication channel. The communication channel is "the means by which messages get from one individual to another" (Rogers, 2003). Communication channels include mass media channels, interpersonal, and interactive channels. Mass media channels include radio, television, newspapers and other media that can easily reach a large audience. Interpersonal channels involve face-to-face interaction among individuals. Interactive channels involve the use of computers and the Internet. Rogers claimed that diffusion of innovations is reliant on interpersonal channels and that diffusion is a social process. Diffusion occurs not because of the scientific merit of the innovation but rather because of the subjective evaluation of the innovation through the social process (Rogers, 2003).

The third element of diffusion of innovations theory is time. The time dimension is measured in terms of how long an innovation diffuses in a social system. Time is involved in the innovation-decision process, in innovativeness, and in rate of adoption of an innovation. The innovation-decision process occurs in five main steps: (1) knowledge, (2) persuasion, (3) decision, (4) implementation, and (5) confirmation. Knowledge happens when a potential

adopter becomes aware of an innovation and learns about the functions of the innovation. Persuasion happens when the potential adopter develops an attitude about the innovation – whether disposed towards or away from the innovation. Decision happens when the potential adopter pursues or rejects the innovation. Implementation happens when the innovation is put to use. Confirmation happens when continued use of the innovation is achieved. Adoption of innovations produces uncertainty among individuals and organizations. Information-seeking and information-processing about the innovation occurs during the innovation-decision process to decrease the threat of uncertainty (Rogers, 2003). The innovation-decision process is illustrated in Figure 3.

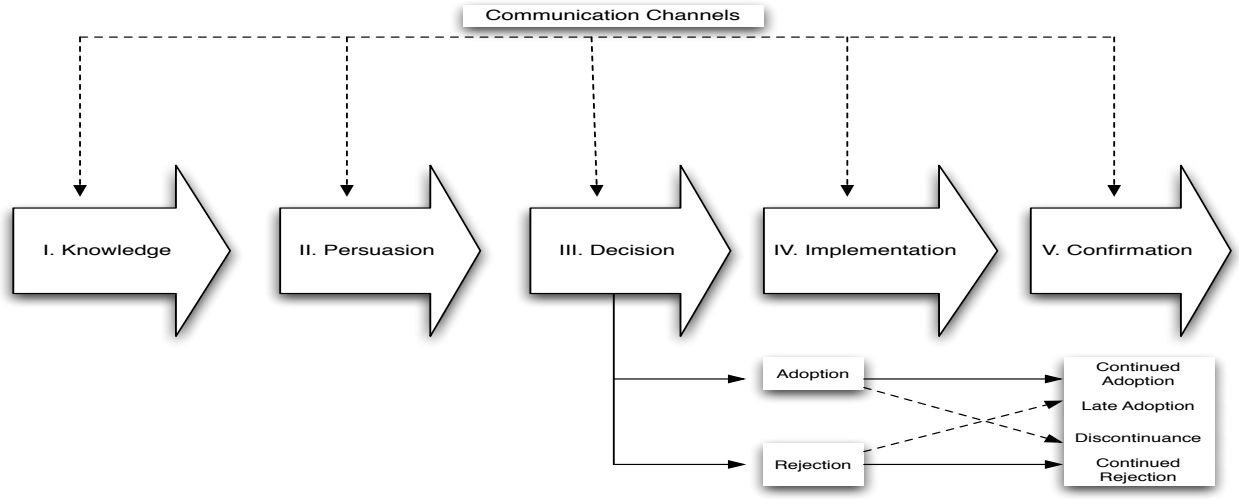

Figure 3. The five stages in the innovation-decision process[2].

Rogers (2003) defined innovativeness as "the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than the other members of a system" (p. 22). Rogers further classified innovativeness into adopter categories of (1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5) laggards. The adopter categories are based

[2] Adapted from "Diffusion of Innovations" by E. M. Rogers, 2003. Diffusion of Innovations, 5th Edition, p. 170. Copyright 2003 The Free Press.

upon when the individual adopts an innovation relative to other members in the system. Innovators are individuals who adopt an innovation the earliest while laggards are the last ones to adopt an innovation (Rogers, 2003). Rate of adoption is measured by length of time. Further, rate of adoption is affected by the perceived attributes of the innovation, the type of the innovation-decision, the communication channels, the nature of the social system, and the extent of the change agent's promotion efforts (Rogers, 2003). The perceived attributes of the innovation and communication channels have been previously discussed. The types of innovation-decision are optional, collective, and authority. Optional innovation-decision is when an individual decides to adopt or reject an innovation regardless of the decision of the group. Collective innovation-decision is when the decision to reject or adopt an innovation is agreed upon by the group. Authority innovation-decision is when the decision to adopt or reject an innovation is made by relatively few people in the group who have the power, status, or expertise. The social system and change agents are discussed in the next section. Rate of adoption is illustrated in Figure 4.

The fourth element is the social system. A social system is composed of a group of individuals who adopt an innovation. This group of individuals exists within a structure that provides stability and regularity to individual behavior in the system. The structure of a social system can either ease or hinder the diffusion of an innovation in the system. Individuals considered as opinion leaders or change agents are considered important in the social system as they can influence individual behavior on innovation adoption. This influence can increase or diminish the rate of adoption of an innovation. Opinion leaders are individuals who are able to informally influence adopters' attitudes or behavior. Change agents are the formal equivalent of

opinion leaders. They are individuals appointed by organizations to lead adopters towards an agreeable innovation-decision for the organization (Rogers, 2003).

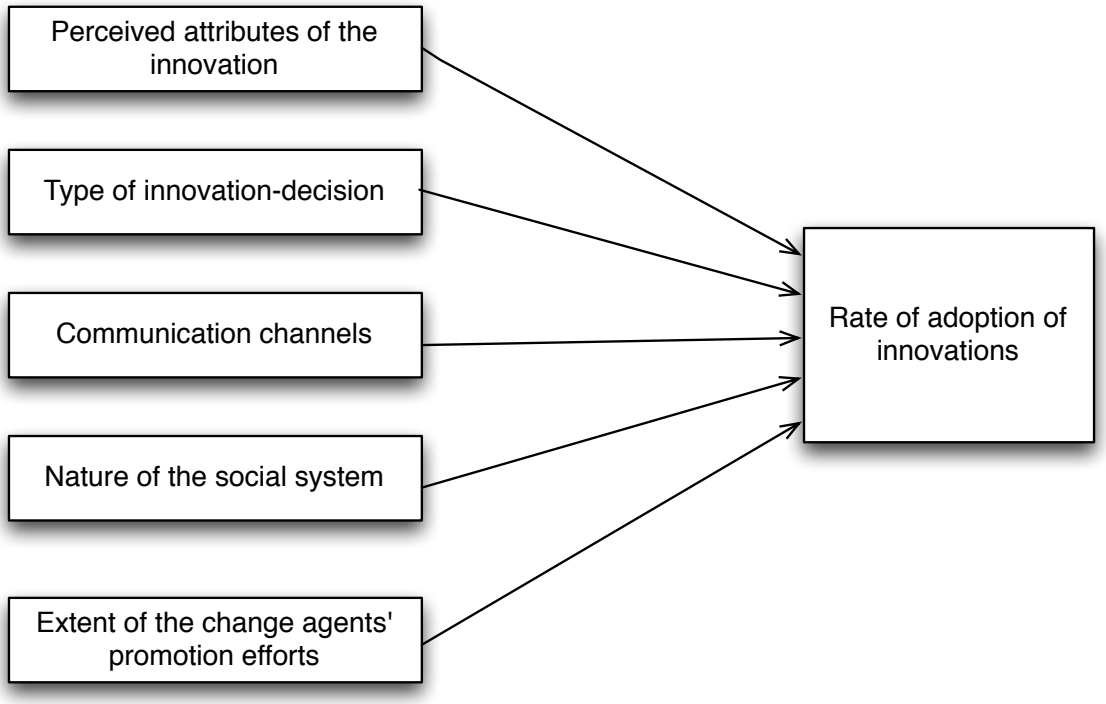

Figure 4. Variables determining the rate of adoption of innovations[3].

The assumptions present in Rogers' diffusion of innovations theory are the pro-innovation bias, individual blame, and the knowledge assumption bias. The assumption of pro-innovation is a bias that innovations are positive, have positive consequences, and should be adapted by a social system as rapidly as possible to benefit from the innovation (Abrahamson, 1991; Greer, 1977; Rogers, 2003). It is assumed that the adoption of the innovation is better than what was previously done and adoption is better than non-adoption or rejection (Greenhalgh, Robert, MacFarlane, Bate, & Kyriakidou, 2004). The "new is better" belief is not necessarily true and may need more rigorous assessment of the benefits that can be derived from the

[3] Adapted from "Diffusion of Innovations" by E. M. Rogers, 2003. Diffusion of Innovations, 5th Edition, p. 222. Copyright 2003 The Free Press.

innovation (D. Smith, Zhang, & Colwell, 1996). Another bias of diffusion of innovations theory is individual blame. When an innovation fails to diffuse or has a slow rate of diffusion it is assumed to be the fault of the individual and not the system (Rogers, 2003). This form of bias is usually implied in the literature and not explicitly stated (Proctor, 2004; Rogers, 2003; Savage, 1985). The theory assumes that knowledge of an innovation will propel utilization (Fitzgerald, Ferlie, Wood, & Hawkins, 2002). This assumption generalizes that people confronted with an innovation will make a positive or negative decision about the innovation rather than maintain a neutral stance.

Diffusion of innovations theory is highly complex composed of multiple concepts and relationships and has been used to guide multiple studies in various sectors including studies in nursing (Brett, 1989; Chang & Liu, 2008; Coyle & Sokop, 1990; Di Pietro et al., 2008; Knol & Van Linge, 2009; Rogers, 2003). The concepts and relationships are clear and are well-described by Rogers (2003). The concepts in the diffusion of innovations theory have mixed accessibility, meaning that some concepts are easier to test compared to others (Chinn & Kramer, 2004). For example, perceived attributes of an innovation is easier to test compared to the effects of time (Lee, 2004; Rogers, 2003). Diffusion of innovations theory is important because it provides perspective of understanding and promoting change at the level of the individual and the organization (Fitzgerald et al., 2002; Haider & Kreps, 2004; Rogers, 2003). Rogers' diffusion of innovations theory has been used to develop various instruments and guided the design of nursing research (Bostrom, Kajermo, Nordstrom, & Wallin, 2008; Funk, Champagne, Wiese, & Tornquist, 1991; Lapierre, Ritchey, & Newhouse, 2004; Rodgers, 2000). There are several limitations to the diffusion of innovations theory. One limitation is the pro-innovation bias - the assumption that innovations lead to improvements. Innovation does not necessarily lead to

improvements (D. Smith et al., 1996). Second, the theory does not provide links to the value that innovations have on organizational performance.

Resource-based view of the firm. The resource-based view of the firm is an economic theory developed by Wernerfelt (1984) to analyze organizations from the resource side. Wernerfelt (1984) claimed that "resources and products are two sides of the same coin" (p. 171). The central tenet of the resource-based view of the firm is that an organization's resources determine the variability in organizational performance (Conner, 1991; Conner & Prahalad, 1996). A firm in this context is any organization that produces a market need (J. B. Barney, 1996; Wernerfelt, 1984). Resources are the organization's tangible and intangible assets (Wernerfelt, 1984). Examples of tangible assets are property, plant, and equipment while examples of intangible assets include knowledge and brand value. Resources usually have value, can be combined, are specific to each firm, unique, and can be traded (Conner, 1991; Makadok, 2001).

Resources are inclusive of all firm assets, capabilities, processes, attributes, information, and knowledge. (J. Barney, 1991). However, Helfat and Peteraf (2003) disagreed with this definition. They distinguished capability as separate from resources and included this modification in their version of the resource-based view of the firm. According to Helfat and Peteraf (2003), a capability "refers to an ability of an organization to perform a coordinated set of tasks, utilizing organizational resources, for the purpose of achieving a particular end result" (p. 999). Capabilities are always intangible and difficult to quantify while resources can either be tangible or intangible (Eisennardt & Martin, 2000; Makadok, 2001; S. G. Winter, 2003). Capabilities require coordinated effort within and among teams in an organization and the use of various resources(Helfat & Peteraf, 2003).

Performance, in the original context of the work by Wernerfelt (1984), is financial performance; this measurement is supported by other authors (Barnett, Greve, & Park, 1994; Bharadwaj, 2000). However, further work on the concept has expanded the meaning of performance to include non-financial performance measures like environmental performance (Russo & Fouts, 1997), manufacturing performance (Schroeder, Bates, & Juntilla, 2002) and nursing home quality (Smith, 2008; Weech-Maldonado, Meret-Hanke, Neff, & Mor, 2004). The resource-based view of the firm is illustrated in Figure 5.

Figure 5. The resource-based view of the firm[4].

Resources are important in the diffusion of innovations. The resources that an organization owns provide the drive for innovation. Financial resources provide the money for research and development. Research and development are essential for the creation and diffusion of innovations. Human resources provide the manpower for the development, promotion, and implementation of new ideas (J. B. Barney, 1996; Dorenbosch, van Engen, & Verhagen, 2005; Lado & Wilson, 1994).

Positive orientation assumptions are present in the resource-based view of the firm. One assumption is that organizations strive for competitive advantage rather than competitive parity (Conner & Prahalad, 1996). Competitive parity is when no one firm obtains competitive advantage (Powell, 2003). There is also the assumption of heterogeneity – organizations differ in their available resources and how they utilize resources (J. Barney, 1991; Bharadwaj, 2000;

[4] Adapted from "A Natural Resource Based-View of the Firm" by S. L. Hart, 1995. *The Academy of Management Review, 20*(4), p. 988. Copyright 1995 Academy of Management.

Newbert, 2007; Smith, 2008; Priem & Butler, 2001). Another assumption is that resources are difficult or expensive to move or copy (J. Barney, 1991; Newbert, 2007; Priem & Butler, 2001).

The resource-based view of the firm is a basic theory (J. B. Barney, 1996; Wernerfelt, 1984). The concepts are clearly defined (Wernerfelt, 1984). The theory has been used in a variety of studies in various disciplines and thus has wide generality (Maijoor & Van Witteloostuijn, 1996; Short, Palmer, & Ketchen Jr, 2002). The concepts are accessible and various instruments are available to measure the concepts (Conner & Prahalad, 1996; Eisennardt & Martin, 2000; Flynn & Flynn, 2004; García-Goņi, Maroto, & Rubalcaba, 2007; S. Winter, 2003). The theory is important as it provides a perspective of viewing resources as the source of variation in organizational performance (J. Barney, Wright, & Ketchen, 2001; García-Goņi et al., 2007; Wernerfelt, 1984). The theory is not specific to nursing but has been used to inform nursing research on nurse staffing and nursing home performance (Weech-Maldonado et al., 2004). A weakness of the resource-based view of the firm is the exclusion of the antecedents to the development of resources. It is assumed that resources are present and the links to the development of these resources are not presented in the theory.

Summary of the theories. Scott and Bruce (1994b) laid the foundation for understanding the antecedents to individual innovative behavior. Diffusion of innovations theory explains how an innovation disseminates through a group of people (Rogers, 2003). Resource-based view of the firm theory provides the basis for studying resources as a source of variability in organizational performance (J. Barney, 1991; Wernerfelt, 1984). Each theory discussed in this paper provided a limited foundation for studies that attempt to link individual innovative behavior and organizational performance.

Several limitations identified are as follows:

1. Individual innovative behavior and diffusion of innovation were assumed to positively affect organizational performance.
2. Presence of knowledge of the innovation was assumed in individual innovative behavior and diffusion of innovation.
3. Individual innovative behavior does not acknowledge but assumed that communication channels and the social system were integral to work relationships.
4. The different individual, group, leader, and organizational attributes were not acknowledged in resource-based view of the firm.

Researchers, practitioners, and organizations have emphasized the importance of individual innovative behavior, research utilization, and the quality and safety of patient care and the role of registered nurses in improvement efforts (AHRQ, 2009, 2010; IOM, 2010a). However, more studies are needed to understand the relationships of these concepts in the context of nursing. Research on individual innovative behavior and research utilization appear to share similar definitions (Schoonover, 2009; S. G. Scott & Bruce, 1994b; Squires, Estabrooks, Gustavsson, & Wallin, 2011). Individual innovative behavior, though extensively studied in the business literature, has not gained enough attention in nursing research (Åmo, 2006; Knol & Van Linge, 2009; S. G. Scott & Bruce, 1994b). Research utilization, a way for registered nurses to innovate in their practice, remains underutilized but is gradually improving according to recent research (Estabrooks, 2009; Kotzer & Arellana, 2008; Squires et al., 2011). Most of the studies on research utilization were conducted in Canada while studies on individual innovative behavior were largely conducted in European countries. The subsequent section reviews the literature on the major variables for this study.

Related Literature

Included in the review of empirical literature are individual innovative behavior, research utilization, autonomy, leader-member exchange, support for innovation, quality and safety of patient care, and hospital innovativeness. The literature is discussed and critiqued, and the gaps are identified.

Individual innovative behavior. Business literature offers some perspective on how individuals can be innovative. An individual's innovative capacity is viewed as the ability to generate, promote, and implement new ideas and is often called individual innovative behavior (De Jong & Den Hartog, 2008; Janssen, 2005; S. G. Scott & Bruce, 1994b). Individual innovative behavior is theoretically linked to the increase in the uptake of innovations. Individual innovative behavior, however, is confused with other concepts like creativity, problem solving and innovativeness, and needs to be clarified. Table 1 provides the definitions of concepts that are sometimes used interchangeably with individual innovative behavior.

Table 1

Definition of Concepts Used Interchangeably with Individual Innovative Behavior

Term	Definition
Creativity	The development of a novel product, idea, or problem solution that is of value to the individual and/or the larger social group (Hennessey & Amabile, 2010, p. 572).
Problem Solving	A form of higher-order thinking where problem solutions arise out of complex mental processes involving recall, evaluation of recalled knowledge, decision-making and further evaluation of outcomes (Hurst, 1985, p. 57).
Innovativeness	The degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than the other members of a system (Rogers, 2003, p. 22)

Individual innovative behavior is a multi-stage (idea generation, promotion, implementation), though not necessarily sequential, process and is different from creativity, problem solving, or innovativeness (De Jong & Den Hartog, 2003; S. G. Scott & Bruce, 1994b). Creativity is synonymous with idea generation, which is a stage of individual innovative behavior (Amabile, Hadley, & Kramer, 2002; Hennessey & Amabile, 2010). Problem solving, on the other hand, is related to individual innovative behavior but solutions presented may not necessarily be new or unique (S. G. Scott & Bruce, 1994b). Innovativeness meanwhile is related to time. A comparison to other members in the same social system is made as to how early a person is in adopting innovations. The earliest adopters are called innovators while the last ones to adopt an innovation are called laggards (Rogers, 2003).The stages of individual innovative behavior also need clarification. New ideas or solutions are developed that generate beneficial change for the organization, through people, products, processes, and services during idea generation (Kleysen & Street, 2001; S. G. Scott & Bruce, 1994b). Idea generation is also about adapting and reconfiguring existing resources to solve problems and/or improve performance (De Jong & Den Hartog, 2003). This stage has been identified by as a key factor in advancing nursing through the development of novel ways to provide care to patients (Gilmartin, 1999). For example, the use of the ventilator-associated pneumonia (VAP) bundle to improve outcomes among critically ill patients is a novel practice (Cason, Tyner, Saunders, & Broome, 2007). The ventilator-associated pneumonia bundle includes suctioning and mouth care of patients at defined intervals as well as raising the head of bed at or greater than 30 degrees at all times (Cason et al., 2007; Krapohl, Manojlovich, Redman, & Zhang, 2010). The application of the VAP bundle has lowered the incidence of ventilator-associated pneumonia among critical care patients (Bird et al., 2010). Nurses previously implemented these identified tasks for ventilator

patients, either singly or in combination, but not in defined intervals or as part of a bundle of interventions. This is one example of how research evidence was implemented as an innovation to improve patient outcomes.

Idea promotion is the championing of the idea and may involve mobilizing resources, persuading, influencing, pushing, negotiating, challenging, and risk-taking (Kleysen & Street, 2001). Workers, in order to implement an innovation, have to seek sponsorship for the idea and build coalitions to support and sell the idea (De Jong & Den Hartog, 2003; S. G. Scott & Bruce, 1994b). Registered nurses usually work as part of a multidisciplinary team and championing an idea is essential to the successful implementation of an innovation by persuading others to adopt the idea (Adams & Bond, 2000; Howell & Boies, 2004).

Idea implementation consists of producing something that is concrete and can be experienced by individuals, and making the idea a regular part of business (Kleysen & Street, 2001; S. G. Scott & Bruce, 1994b). For example, a service process can be designed and improved based on feedback from customers and employees (Alexander, Weiner, Shortell, & Baker, 2007; Cybulski et al., 2006). Idea implementation in healthcare may involve new ways of delivering care (e.g. ventilator associated pneumonia guidelines) or providing a new service to patients (e.g. spa services in hospitals) (Banaszak-Holl, Zinn, & Mor, 1996; Cason et al., 2007; Chapman, Zechel, Carter, & Abbott, 2004).

Individual innovative behavior is considered important for several reasons. One reason is because of the capacity of employees to generate ideas and to translate these ideas into better organizational performance (Tarantino, 2005; Van de Ven, 1986). Nurses are well positioned to provide input into performance improvements, which can include service or cost improvements, as well as promote and implement new ideas, as they are closest to the point of care (Brett, 1989;

Clarke et al., 2005; Pappas, 2007). Although nurses have traditionally worked in bureaucratic and hierarchical environments that hamper innovative behavior (Donaldson et al., 2004), this environment is rapidly changing and nurses are being placed in positions where they have to make important clinical decisions that require the generation, promotion, and implementation of new ideas (AHRQ, 2010; Erickson, McNamara, Balanay, & Fields, 2008; F. Hughes, 2006). The implementation of the Affordable Care Act of 2010, as well as the increasing costs of healthcare, are bringing about these changes in healthcare (IOM, 2009; A. Jha, Orav, Dobson, Book, & Epstein, 2009; Treston, 2013; Webb, 2012; Young & Olsen, 2010). Examples of these new ideas pertinent to registered nurses include the clinical nurse leader and patient care coordinator roles, transforming care at the bedside initiative, and the use of research evidence at the point of care; each of these has shown some associations with improvements in patient outcomes (Estabrooks, 2009; Needleman et al., 2009; Skillings & MacLeod, 2009; Stanley et al., 2008).

Individual innovative behavior is considered important in knowledge-intensive organizations because of the theoretical link to increasing the uptake of innovations, and positive associations to increased job productivity (the output associated with organizational goals) and innovative output (the production and contribution of ideas) (Chang & Liu, 2008; De Jong & Den Hartog, 2003, 2008; Dorenbosch et al., 2005; Rogers, 2003; S. G. Scott & Bruce, 1994b). Registered nurses are knowledge workers in environments that are knowledge intensive (Altun, 2008; Bonner & Sando, 2008; Covell, 2008; Guptill, 2005; Pritchard, 2006) and frequently encounter innovations, like findings from research, in practice (Estabrooks, 2009). Individual innovative behavior may be instrumental to accelerating and increasing uptake of innovations in the organization and thus assist organizations in achieving better outcomes.

Engaging in innovative acts in an organization, however, is a risky endeavor (Yuan & Woodman, 2010). The behavior usually entails difficulties, obstacles, and frustration (Carmeli et al., 2006). Substantial efforts are required to complete all stages of the innovation process and individuals may face resistance during this process (Saint et al., 2009). This is because people tend to embrace stability and resist the insecurity of change that the innovation process entails (Carmeli et al., 2006). Individual innovative behavior, therefore, merits exploration in nursing for the potential benefits to services and costs improvement, accelerating and increasing the uptake of innovations and thus research utilization, and assisting organizations in achieving better outcomes.

Multiple individual, leader, group, and organizational variables were found to have an association with individual innovative behavior (Basu & Green, 1997; Dorenbosch et al., 2005; Knol & Van Linge, 2009; Van der Vegt & Janssen, 2003; Yuan & Woodman, 2010). Examples of individual level variables that were implicated included age, role, and level of education (Dorenbosch et al., 2005; Janssen, 2005; Sanders et al., 2010; Zhou, Zhang, & Montoro-Sanchez, 2009). Those who were younger, in higher-level positions in the organization, or who had higher level of education also had higher levels of individual innovative behavior (Dorenbosch et al., 2005; Janssen, 2001, 2005; Sanders et al., 2010; Zhou et al., 2009). Variables with the most consistent positive relationships with individual innovative behavior included autonomy, leader-member exchange and support for innovation (Basu & Green, 1997; De Jong & Kemp, 2003; S. G. Scott & Bruce, 1994b, 1998; Wang, Law, & Chen, 2008). Although there were multiple studies available in the business literature, there were a limited number of studies available in healthcare.

There were eight studies on individual innovative behavior in healthcare, only three of which were specific to nursing (Åmo, 2006; Bunce & West, 1995; Chang & Liu, 2008; Knol & Van Linge, 2009; Reuvers, Van Engen, Vinkenburg, & Wilson-Evered, 2008; Salge & Vera, 2009; Weng, Huang, & Lin, 2013; Widianto, Adbdullah, Kautsar, & Meiyanti, 2012). These studies are separately discussed in this section to provide clarity as to what has been studied in nursing and healthcare.

The three nursing studies explored individual-level attributes and their relationships with individual innovative behavior (Chang & Liu, 2008; Knol & Van Linge, 2009; Weng et al., 2013). Chang and Liu (2008) in a study of Taiwanese public health nurses found that psychological empowerment along with organizational empowerment and individual innovative behavior explained 16% of the variance in job productivity. This is one of the few studies that used innovative behavior as an independent variable. However, a critique of this study was the use of job productivity as a metric for nurse work. The work of nurses is usually difficult to measure. The job productivity measure used here was not necessarily reflective of the work of public health nurses. Rather, the measure reflected the operational productivity of nurses such as coming in to work on time or not being out sick. A study by Knol and Van Linge (2009) of 519 Dutch hospital nurses found that psychological empowerment had a significantly positive relationship on individual innovative behavior. However, the degree of individual innovative behavior and a comparison of individual innovative behavior between nurses and non-nurses were not included in the article. The study by Weng et al. (Weng et al., 2013) of 808 registered nurses in Taiwan found that age, hospital experience, and nursing experience were positively correlated with individual innovative behavior but were not found to have a relationship with

individual innovative behavior when hierarchical linear modeling was used to analyze the relationships.

The five non-nursing studies in healthcare are from Amo (2006), Bunce and West (1995), Reuvers et al. (2008), Widianto et al. (2012), and Salge and Vera (2009). Some of these studies included nurses and some did not specify which healthcare workers were included. Amo (2006) studied 555 healthcare workers employed in 12 Norwegian local municipalities. Regression analysis revealed that encouragement from management, innovative behavior of colleagues, plus the control variables of full-time status, working in an institution, and age explained 49% of the variance in the healthcare workers' innovative behavior. Bunce and West (1995) studied employees (including nurses) of the United Kingdom National Health Service. They found that participative safety, support for innovation, and propensity to innovate were positively related to innovative behavior. Reuvers et al. (2008) in a study of 335 healthcare workers from 4 hospitals in Australia found that transformational leadership was positively correlated with individual innovative behavior. Widianto et al. (2012) in a study of 160 pharmacists from Indonesian hospitals found that individual innovative behavior was positively correlated with job embeddedness, self-efficacy, and work engagement. Some of these concepts have been studied in nursing although not in the context of individual innovative behavior. For example, participative safety was found to have a significant positive association to organizational commitment among temporary nurses (Jalonen, Virtanen, Vahtera, Elovainio, & Kivimaki, 2006).

Organizational performance metrics like financial performance (e.g. return on income, profit, expenses) and quality of care (e.g. mortality, morbidity) are important for healthcare organizations to assess their effectiveness internally and to compare themselves to other

organizations (Barnett et al., 1994; Love, Revere, & Black, 2008; Weech-Maldonado et al., 2004). Quality and financial improvements can be achieved by using financial performance and outcomes of care metrics to continually assess the performance of the healthcare organization (Hammermeister, Shroyer, Sethi, & Grover, 1995). The study by Salge and Vera (2009) showed individual innovative behavior to have an association with organizational performance.

Salge and Vera (2009) in a study of 68,000 healthcare workers in 173 National Health Service acute care trusts in England found that individual innovative behavior aggregated to the hospital level had a significant and positive relationship to patient satisfaction, service quality rating, return on income, income per bed, and resource use rating. One of the strengths of this study was the large sample size at both the individual and organizational levels. However, a weakness of this study was that workers in hospitals are not differentiated by whether they were nurses, doctors, administrators, or ancillary workers. This was one of the few studies that used individual innovative behavior as an independent variable. Studies on individual innovative behavior usually use the concept as a dependent variable or outcome variable (Carmeli et al., 2006; Subramaniam, 2007; Yuan & Woodman, 2010). The study by Salge and Vera (2009) was the only study that determined the association between individual innovative behavior and organizational performance in healthcare.

Research utilization. Evidence-based care is the integration of the best evidence with clinical expertise and patient values (Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000). Use of research findings or research utilization is a more specific subset of evidence-based care. Research utilization is the use of the findings of scientific studies to guide clinical practice (Estabrooks, 2009). Research utilization in nursing is of increasing interest to managers, policymakers, and researchers because of the potential role that the use of evidence plays in

improving outcomes (Estabrooks, 2009; Schoonover, 2009). Research utilization has a long history in nursing, from its use by Florence Nightingale to the current resurgence of using the results of research in nursing practice (Estabrooks et al., 2008; Gale & Schaffer, 2009; Profetto-McGrath, Smith, Hugo, Patel, & Dussault, 2009; Squires et al., 2011).

Research utilization is a process that should result in innovations and is a way for nurses to change their practice. Research utilization is constantly changing as new findings emerge and are incorporated into nursing practice (Brown, Wickline, Ecoff, & Glaser, 2009; Gale & Schaffer, 2009; Munroe, Duffy, & Fisher, 2008). Integrating and assimilating research findings at the bedside is necessary to deliver nursing care based on current evidence (Strickland & O'Leary-Kelley, 2009). However, research utilization has had slow uptake in healthcare. On average, the time to full application of evidence into clinical practice is about 17 years (Balas & Boren, 2000; Berwick, 2003). The lag time from research to implementation at the bedside has consequences especially when the evidence suggests that a change in practice has resulting improvements in patient outcomes and organizational performance (Berwick, 2003). The challenge is not just slow uptake but also the low uptake of research utilization among nurses (Rodgers, 2000). In a study of 106 rural nurses from a southwestern state in the United States, Olade (2004) found that only 20.8% of the participants were involved in research utilization. A study by Cadmus, et al. (2008) in a study of 3,411 acute care nurses from New Jersey found that greater than 50% of the participants never identified, participated, or evaluated research reports. Another startling finding was that 43.7% of the participants never used research findings in their practice. These findings are a concern because a large number of registered nurses appear to not use research findings to inform and change their practice. Multiple factors contribute to the uptake of research findings in clinical practice.

Several barriers were identified in nursing that contributes to the low uptake of research utilization. Several studies used the 'BARRIERS to research utilization' questionnaire to rank the barriers to research utilization (Atkinson, Turkel, & Cashy, 2008; Funk et al., 1991). The instrument lists a set of barriers to research utilization and ask responders to rank what they perceive as the barriers to research utilization in their organization. Examples of the barriers listed in the instrument include lack of knowledge about the research, insufficient time, lack of availability of the research reports, lack of authority to change clinical practice, not enough time to read research reports, or lack of understanding of statistical analyses (Brown et al., 2009; Fink, Thompson, & Bonnes, 2005; Parahoo & McCaughan, 2001). The individual rankings of these different "barriers to research utilization" vary across the different studies. However, the top-ranked individual barriers remain similar across different roles and settings despite changes in the rankings (Brown et al., 2009; Carlson & Plonczynski, 2008; Retsas, 2000). For example, "lack of authority to change clinical practice" was ranked first in some studies and third in other studies but remained consistently identified as one of the top barriers to research utilization (Brown et al., 2009; Schoonover, 2009; Strickland & O'Leary-Kelley, 2009). Other top ranked barriers included insufficient time on the job to implement new ideas, nurses did not feel capable of evaluating the quality of the research, and did not have time to read research (Schoonover, 2009; Strickland & O'Leary-Kelley, 2009). Yet, such reported barriers did not fully answer why there is low uptake of research findings in nursing practice.

Individual and organizational attributes were also found to hinder or facilitate research utilization among registered nurses (Cummings, Estabrooks, Midodzi, Wallin, & Hayduk, 2007; Estabrooks, 1999b; Schoonover, 2009; S. D. Scott et al., 2008; Strickland & O'Leary-Kelley, 2009). A review by Estabrooks (2009) of the literature on research utilization found that

individual-level variables that consistently had a relationship to research utilization were a positive attitude toward research, in-service education attendance, and belief suspension (the ability to accept results that contradict prior knowledge). These individual attributes were positively associated with increased research utilization. Organizational attributes found to have a relationship with research utilization included organizational size, organizational support, access to research, and time (Estabrooks, 2009). The evidence on organizational size was mixed and may be attributed to other unidentified variables (Estabrooks, 2009; Schoonover, 2009). Nurses who were provided with organizational support, access to research, and time also had higher levels of research utilization (Cummings et al., 2007; Rodgers, 2000; Schoonover, 2009).

Various ethnographic studies of research utilization found that several factors affected how nurses approach research utilization. A study of Canadian pediatric nurses found that lack of time and busyness interfered with efforts to seek out, digest, and use research (Thompson et al., 2008). Another study of critical care nurses found that hierarchical structure and inconsistent leader expectations impacted research utilization (S. Scott & Pollock, 2008). In another ethnographic study of nurses in a pediatric critical care unit, researchers found that uncertainty, the nature and structure of nurses' work, and the way nurses valued clinical, specialized practice, and research knowledge had an impact on research utilization (S. D. Scott et al., 2008). These studies identified other factors that contributed to the slow and low uptake of research findings into nursing practice.

Several other factors linked to research utilization included emotional exhaustion, relational capital, facilitation, nurse-to-nurse collaboration, autonomy, responsive administration, staffing support, co-worker support, confidence in critical thinking, innovative organization and working in a critical care area. Emotional exhaustion was found to have a negative effect on

research utilization (Cummings et al., 2007; Estabrooks, Midodzi, et al., 2007). Estabrooks et al. (2007) found that research utilization increased with better relationships among multidisciplinary staff, facilitation, nurse-to-nurse collaboration, and autonomy. Also, the likelihood of research utilization increased with the organizational variables of innovative organization, responsive administration, and staffing support. Confidence in critical thinking was positively and significantly associated with research utilization (Profetto-McGrath et al., 2009). Those who worked in critical care areas showed higher research utilization compared to those who did not work in critical care (Forbes, Bott, & Taunton, 1997; Squires, Moralejo, & Lefort, 2007). Some of these variables were similar to the variables associated with individual innovative behavior.

Autonomy. Autonomy is the extent to which followers are given latitude to carry out their tasks without excessive supervision (Basu & Green, 1997). Previous studies found significantly positive relationships between individual innovative behavior and autonomy (Basu & Green, 1997; De Jong & Kemp, 2003; Krause, 2004). Strengths of these studies included large sample sizes (N= 225 to 399) and a survey design that included the perception of both the supervisor and the subordinate. However, these studies were done in the business industry that included a manufacturing plant in the Midwest, a knowledge intensive company in the Netherlands, and various German organizations. Weaknesses of these studies included a single organization for the recruitment of the sample and, when there were several organizations included in the recruitment of the sample, comparisons between the organizations were not included in the study.

Leaders who granted employees freedom and autonomy, and also included them in the decision-making process, had a significantly positive association to individual innovative behavior (De Jong & Den Hartog, 2003; Krause, 2004). Another study found that nurses who felt

they had a certain degree of autonomy granted by the leaders in their practice were more confident in their ability to promote research utilization (Lacey, 1994). Other studies of autonomy in nursing found that the concept correlated positively with education, experience, team work, control over resources, relationship with doctors, decision making, job satisfaction, perceived quality of care, nurse managers' actions, and supportive management (Mrayyan, 2004; Rafferty, Ball, & Aiken, 2001; J. S. Smith, Kirksey, Becker, & Brown, 2011). There was a negative correlation with burnout (Rafferty et al., 2001). However, the relationship between autonomy and individual innovative behavior has not been previously explored in nursing.

Leader-member exchange. Leader-member exchange is the interaction process between leaders and subordinates (S. G. Scott & Bruce, 1994b). The quality of this interaction process that employees develop with their leaders was found to have a significantly positive association to individual innovative behavior (Basu & Green, 1997; Ishak, 2005; Sanders et al., 2010; S. G. Scott & Bruce, 1994a, 1998; Subramaniam, 2007; Yuan & Woodman, 2010). In nursing studies of leader-member exchange several relationships were found significant. Significant positive relationships were found between leader-member exchange and job involvement, organizational identification, supervisor performance ratings, satisfaction with supervisor, job satisfaction, core self-evaluation (an individual's evaluation of themselves and their self worth; i.e. self esteem, general self efficacy, locus of control, emotional stability), empowerment, trust, support, altruism, use of intuition, commitment, and less turnover intentions (Chen, Wang, Chang, & Hu, 2008; Han & Jekel, 2011; Katrinli, Atabay, Gunay, & Guneri, 2008; Laschinger, Purdy, & Almost, 2007; Spence Laschinger, Finegan, & Wilk, 2011; Vecchio & Norris, 1996; Wayne & Green, 1993). A study on leader-exchange and safety climate in one hospital found that units with high leader-member exchange quality were significantly different from those units that had middle or

low leader-member exchange on supervisor expectations and actions promoting safety, organizational learning through continuous improvement, communication openness, feedback and communication about error, and non-punitive response to error (Thompson, et al., 2011). High leader-member exchange units scored higher in the aforementioned dimensions compared to middle and low leader-member exchange units. Significant negative relationships were found with emotional exhaustion, years in nursing, and job related impression management (Spence Laschinger, et al., 2011; Wayne & Green, 1993).

Leader-member exchange had a consistent relationship with individual innovative behavior in the business literature (Basu & Green, 1997; Ishak, 2005; S. G. Scott & Bruce, 1994b; Subramaniam, 2007; Yuan & Woodman, 2010). However, its relationship to individual innovative behavior and research utilization has not previously been explored among registered nurses. Leader-member exchange was included in this study for these reasons.

Support for innovation. Support for innovation is the expectation, approval, and practical support of attempts to introduce new and improved ways of doing things in the work environment (Bunce & West, 1995). Support for innovation had a significantly positive relationship to individual innovative behavior (Bunce & West, 1995; De Jong & Kemp, 2003; Krause, 2004; Pundt, Martins, & Nerdinger, 2010). Strengths of these studies included large sample sizes (N=148 to 519) and a consistent relationship with individual innovative behavior; one of the main weakness of these studies was that they were conducted mostly in European countries (United Kingdom, The Netherlands, and Germany).

A search for literature on support for innovation in nursing revealed no previous studies of the concept. However, similar to support for innovation is organizational support, which has previously been studied in nursing. Studies of organizational support in nursing found

significantly positive relationships to job satisfaction, organizational commitment, effort, quality of care, energy level, structural empowerment, career satisfaction, and intention to remain on the job (Armstrong-Stassen & Ursel, 2009; Kwak, Chung, Xu, & Eun-Jung, 2010; Laschinger, Purdy, Cho, & Almost, 2006; Patrick & Laschinger, 2006). Negative relationships were found with physical symptoms, emotional exhaustion, and burnout (Kwak et al., 2010; Laschinger et al., 2006). Weak organizational support in hospitals was linked to job dissatisfaction among nurses and hospitals that were perceived to provide the lowest level of support for nursing care were more than twice as likely to be rated as providing fair or poor quality of care (Aiken, Clarke, & Sloane, 2002).

Quality and safety of patient care. Quality and safety of patient care is another emphasis in healthcare (AHRQ, 2009; Aspden, Corrigan, Wolcott, & Erickson, 2004; IOM, 2010a). The quality and safety of patient care in the United States continues to be scrutinized by various stakeholders. At the organizational level, quality and safety of patient care are considered key attributes of organizational performance. Quality is defined by the IOM as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (Lohr, 1990, p. 21). Safety is defined by the IOM as "the prevention of harm to patients" (Aspden et al., 2004, p. 333). Safety, therefore, is an inherent part of the quality of patient care (Mitchell & Lang, 2004). Nurses play an important role in the quality and safety of patient care as they maintain close contact to patients at the bedside, provide direct care for patients, as well as assess, monitor, treat, and discharge patients (Donaldson et al., 2004; Pearson et al., 2000).

AHRQ (2009) in a report on healthcare quality in the United States found that the quality of care remains suboptimal, although it is improving at a slow pace. Effort is needed to

accelerate improvement. A current study of the safety of patient care found that patient harm remained common in hospitals despite efforts undertaken to improve patient safety (Landrigan et al., 2010). The study by Landrigan et al. (2010) found no significant change in the overall rate of harm among patients admitted into hospitals over the last 5 years. Other studies have found that patients admitted into hospitals sometimes do not receive the care that they require (A. K. Jha, Li, Orav, & Epstein, 2005). A change is required to improve patient care. Nurses need to fully engage in finding ways to improve the quality and safety of patient care.

Multiple measures have been used to determine the quality and safety of patient care (Kendall-Gallagher, Aiken, Sloane, & Cimiotti, 2011; Tzeng & Yin, 2008; Weingart et al., 2009). One of these was the perceived quality and safety of patient care, as viewed by healthcare providers (Aiken et al., 2002). Perceived quality and safety of patient care was the personal interpretation of nurses of the quality and safety of care they delivered to patients, and was considered useful because it integrated several dimensions of nursing care and was an indicator of the therapeutic and clinical care that nurses provided to their patients (Aiken et al., 2002; Andrews, Burr, & Bushy, 2011; Pearson et al., 2000; Redfern & Norman, 1999). Perceived quality of care and safety is also a proxy for how patients view their care experience and these two perspective have previously been found concordant (Redfern & Norman, 1999).

Studies have shown that perceived quality and safety of care were associated with the way nurses viewed themselves professionally as well as how they experienced burnout in their jobs. Some researchers found that nurses who had a better view of their professional self also had a better perception of the quality and safety of patient care (Andrews et al., 2011). Nurses often felt overworked and overwhelmed, frustrated, disrespected, and found they lacked time to do their work. Oftentimes, these feelings contributed to their perception of the care they provided to

patients. Similar to the aforementioned feelings was burnout. Burnout occurs when individuals who work with people experience emotional exhaustion, pessimism, and a devalued sense of self at work (Maslach & Jackson, 1981). One study found a significantly negative association between nurse burnout and perceived quality of care (Poghosyan, Clarke, Finlayson, & Aiken, 2010). Nurse-perceived quality may represent both the nurses' view of the care they provided to patients and also may provide an indirect view of the patient perspective of the care experience. Perceived quality of care, however, was not just associated with individual-level factors but organizational-level factors as well.

At the organizational level, hospitals that were perceived to have the least organizational support, for example human capital and managerial support, for nursing care were more likely to be perceived by nurses as providing lower quality of care to patients (Aiken et al., 2002; Kwak et al., 2010). This meant that nurses working in organizations needed these elements of organizational support, as well as an environment conducive to exploration, to enable them to provide desirable quality of patient care.

Hospital innovativeness. Rogers (2003) defined innovativeness as "the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a system" (p. 22). Hospital innovativeness, therefore, is a comparison of a hospital to other hospitals on how early the organization was in adopting an innovation (Hage, 1999; Rogers, 2003). Typically innovativeness in organizations is measured by the number of awards, number of patents acquired by companies, number of innovations adopted within a given period, or percentage of innovations adopted (Damanpour, 1991). Methods used to measure healthcare innovativeness included adoption of new radiology products, information technology adoption, adoption of nursing home special care units and sub-acute care services, or a bundle of service

and technical innovations (Banaszak-Holl et al., 1996; Castle, 2001; Goes & Park, 1997; Robertson & Wind, 1983; Snyder & Fields, 2006). Hospital innovativeness was linked to decreased mortality, better patient satisfaction, and higher income per bed in previous studies (Salge & Vera, 2009). A pilot study by Grieger, Cohen, and Krusch (2007) to determine the cost savings from the implementation of an electronic health record in an ambulatory care setting found that the organization was able to save $246,934 (after 2 years) from chart pulls, $27,872 from new chart costs, $25,000 from chart filling time, $91,000 per year from support staff, and $30,500 per year from transcription cost. This study provided a basis for cost savings that can be achieved from the use of the electronic health record in the ambulatory care setting. The applicability to the acute care setting may be different. However, another study found that EMR implementation was associated with higher rates of total falls and injury falls, higher hospital costs and length of stay, higher levels of nurse staffing, and higher complications (Furukawa, Raghu, & Shao, 2010a, 2010b). These findings were contrary to hypothesized relationships that EMR implementation is supposed to have with these variables. These inconsistencies may be the result of differences in measuring electronic medical record implementation.

Gaps in the literature. Several gaps exist in the literature on individual innovative behavior including: (1) lack of statistical description of individual innovative behavior, (2) its use only as a dependent variable, (3) few studies in nursing, (4) non-replicated studies, and (5) poor exploration of the relationship of individual innovative behavior and organizational performance. These gaps are further discussed next.

Individual innovative behavior was not well described in the literature. Correlations to other variables are often presented but individual innovative behavior itself was not described. The degree or range of individual innovative behavior has not been discussed or presented in the

articles. Also, comparisons between different groups of people have not been done (e.g. knowledge workers vs. retail) (Chang & Liu, 2008; De Jong & Den Hartog, 2003; Janssen, 2000; Reuvers et al., 2008).

As stated earlier, individual innovative behavior was mostly used as a dependent variable. Only a few studies have used individual innovative behavior as an independent variable. More studies are needed that use the concept as an independent variable to further advance knowledge about individual innovative behavior (Åmo, 2006; Chang & Liu, 2008; De Jong & Den Hartog, 2003; Janssen, 2000; Krause, 2004; Salge & Vera, 2009).

The studies found in this literature review were mostly in the general business literature. Studies in nursing were very limited. The three studies involving nurses that used measures of individual innovative behavior did not further describe individual innovative behavior among nurses (Chang & Liu, 2008; Knol & Van Linge, 2009; Weng et al., 2013). For example, there were no comparisons of individual innovative behavior among nurses who worked in different roles or areas (Chang & Liu, 2008; Knol & Van Linge, 2009).

Most studies on the antecedents to individual innovative behavior have not been replicated. Exceptions were studies that used the following variables: autonomy, education, job tenure, leader-member exchange, leader-role expectations, problem-solving style, and support for innovation (Bunce & West, 1995; De Jong & Den Hartog, 2003; Dorenbosch et al., 2005; Janssen, 2001; Krause, 2004; Sanders et al., 2010; S. G. Scott & Bruce, 1994b, 1998; Subramaniam, 2007; Zhou et al., 2009). Support for the validity of individual innovative behavior can only be achieved by replicating methods used in other studies.

The relationship of individual innovative behavior to organizational performance was poorly explored. Only two studies have established relationships to job productivity and

innovative output. Even though these relationships were significant, the association to job productivity was weak (Chang & Liu, 2008). Innovative output was considered a poor metric to gauge the innovativeness of an employee (De Jong & Den Hartog, 2008). The field could benefit from the exploration of the role of individual innovative behavior in organizational performance.

Summary

One of the major research themes of studies in research utilization was the identification and ranking of barriers and facilitators to research utilization (Atkinson et al., 2008; Brown et al., 2009; Schoonover, 2009; Strickland & O'Leary-Kelley, 2009). Research utilization has also been studied in terms of specific levels of evidence like the application of the ventilator-associated pneumonia bundle in critical care (Crimlisk et al., 2009; Kleinpell, Munro, & Giuliano, 2009). Research utilization as a general concept has been gaining resurgence in the past few years (Estabrooks, 2009; S. Scott & Pollock, 2008; S. D. Scott et al., 2008). Most of these studies have been descriptive in nature with only a few studies exploring research utilization as an independent or dependent variable.

The main variables that were explored in this research study were autonomy, leader-member exchange, support for innovation, individual innovative behavior, research utilization and the quality and safety of patient care. These variables are illustrated in Figure 6. Different aspects of the three theories discussed earlier in this chapter are included in the proposed framework. Autonomy, leader-member exchange, and support for innovation were the three most consistent attributes that were found to have relationships with individual innovative behavior. These attributes were considered to be leader (autonomy), social system (leader-member exchange) and organizational (support for innovation) based on Roger's (2003) diffusion of innovations theory. These attributes were also discussed in Scott and Bruce's (1994b) individual

innovative behavior as some of the antecedents to innovative behavior. Following the resource-based view of the firm the registered nurse was considered to be a capital resource, and the nurse's capabilities directly contribute to the firm's performance (Wernerfelt, 1984). Capabilities (the ability to use organizational resource and perform a coordinated set of tasks for the purpose of achieving a particular end result) can be in the form of individual innovative behavior or research utilization (Helfat & Peteraf, 2003). Performance for hospitals may be in the form of the quality and safety of patient care (Douglas & Ryman, 2003).

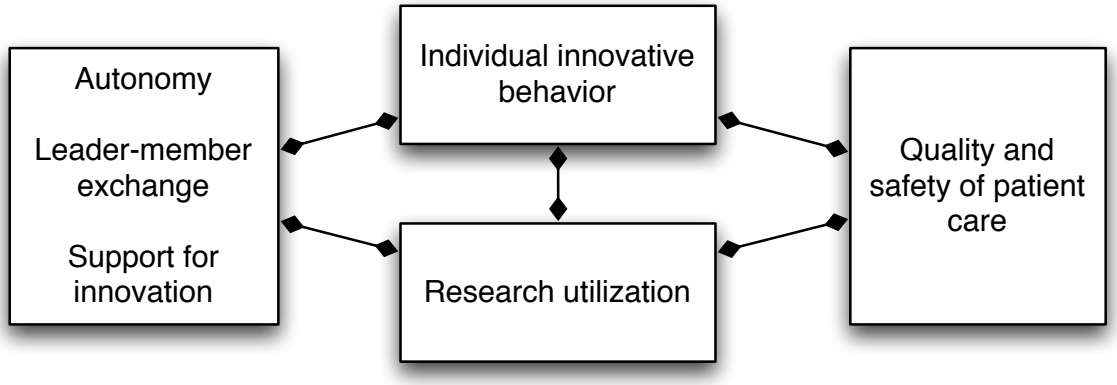

Figure 6. Antecedent variables, individual innovative behavior, research utilization, and quality and safety of patient care.

Additional individual level factors that were included were attitudes towards research, belief suspension, and the number of in-services and continuing education courses attended. These variables were selected because of the consistent relationships found between these variables and research utilization (Estabrooks, 1999b, 2009). Demographic variables included gender, age, level of education, clinical area, and specialty certification was selected because of the role they played in individual innovative behavior and research utilization. Hospital level variables of hospital innovativeness and hospital size were included as well.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

This chapter details the methods that were used in this study. Included in this chapter are an explanation of the research design, a description of the sample, data collection methods, and the procedures by which the data were collected and analyzed to answer the aims of this study. The purpose of the study and the specific aims from Chapter One are repeated below.

Purpose

The purpose of this study was to describe individual innovative behavior among registered nurses and discover if there was a relationship to research utilization and the quality and safety of patient care. Understanding the role of individual innovative behavior in research utilization may provide some guidance in increasing and accelerating the uptake of research in practice. This knowledge may guide managers and administrators in promoting individual innovative behavior and supporting future practice, research, and education initiatives. Additionally, this study described research utilization, autonomy, leader-member exchange, support for innovation, and the quality and safety of patient care. Interventions can be designed to improve registered nurse individual innovative behavior and research utilization by determining the relationship between the variables.

Specific Aims

The specific aims of this study were as follows:

1. Describe individual innovative behavior, research utilization, autonomy, leader-member exchange, support for innovation, and the quality and safety of patient care among registered nurses working in acute care hospitals.

2. Describe the relationships among the antecedent variables (autonomy, leader-member exchange, support for innovation), individual innovative behavior and research utilization.
3. Describe the relationships among individual innovative behavior, research utilization, and the quality and safety of patient care.

Research Hypotheses

The research hypotheses for this study:

Hypothesis 1: Better autonomy, leader-member exchange and support for innovation increase individual innovative behavior among registered nurses who work in acute care hospitals, controlling for covariates.

Hypothesis 2: Better individual innovative behavior increases research utilization among registered nurses who work in acute care hospitals, after controlling for covariates.

Hypothesis 3: Better individual innovative behavior and research utilization increase the likelihood of perceived high quality of patient care.

Hypothesis 4: Better individual innovative behavior and research utilization increase the likelihood of perceived high safety of patient care.

Research Design

A descriptive, cross-sectional design was used for this study. This research design allowed for comparison of registered nurses' perceptions of individual innovative behavior, autonomy, leader-member exchange, support for innovation, research utilization, and the quality and safety of patient care. Descriptive research allowed for the exploration and classification of the phenomena of interest and this design is best suited for this study because individual innovative behavior is a relatively new concept in nursing and exploration of the concept as it pertains to registered nurses is needed (Burns & Grove, 2001).

Setting and Sample

Setting. The setting for this study was acute care hospitals in California. Hospitals are the practice settings most likely to provide nurses with opportunities for individual innovative behavior and research utilization. In addition, the large number of nurses who practice in acute care hospitals increased the possibility of meeting the sample size needed for this study (Moore, 2008).

Nature and size of the sample. The target population for this study was full-time registered nurses working in acute care hospitals. The sample of registered nurses was recruited from the selected hospitals in California.

Criteria for sample selection. Sample selection was based on the following criteria:

1. Hospitals were selected to represent various levels of innovativeness. Then nurses from these hospitals were invited to participate.
2. Registered nurse who had an active license to practice in the United States.
3. Registered nurse who worked full-, part-time, or on a per-diem basis in the selected hospitals.

Exclusion criteria. Registered nurse respondents who reported that they were in a management role were excluded from this study.

Procedures

Human subjects. Permission to conduct this study was obtained from the University of California San Francisco's Committee on Human Subjects Research (CHR) and from each hospital's Institutional Review Board (IRB) if required by the hospital. No benefit or payment of any kind was offered to the participants and participation in this study was strictly voluntary. An introductory letter for the study was included with the survey questionnaire, and the voluntary

nature of the participation was explained. Participants were informed in the introduction letter that return of the completed survey indicated their implied consent to participate in the study. The participants were not identified by name or other identifying information, and the completed instruments were held confidential according to the study protocol as approved by the CHR.

Study procedures. After CHR approval from UCSF, hospitals were recruited through the Chief Nurse Executives (CNE) of each hospital. The CNEs of hospitals in California were approached for interest in this study through a letter of introduction (by post and/or by e-mail) providing the background and purpose of the study. Appendix 1 includes the letter of introduction to the CNEs. Figure 7 displays the recruitment process used for this study. Initial recruitment included 90 hospitals for which data on the degree of adoption of Electronic Medical Records (EMRs) were reported in the HIMSS database (The Dorenfest Institute for H.I.T. Research and Education, 2010). There was a poor response from these hospitals after multiple attempts to recruit including sending out multiple e-mails to the CNEs as well as printed letters delivered through the United States Postal Service. In order to ensure a sufficient sample for this study, the decision was made to recruit from other hospitals for which the EMR adoption rate was not known. A contact list of California CNEs along with their email addresses was used to recruit the CNEs. An additional 311 hospitals were included in the recruitment for a total of 401 hospital CNEs recruited. A total of 9 hospital CNEs agreed to recruit registered nurses working in their individual hospitals.

Once a CNE agreed to have his/her hospital in the study, a determination of whether the hospital required approval from its own IRB was made and, if necessary, a protocol was submitted. Once IRB approval was received from a hospital, an introductory letter and printed survey was distributed to the population of registered nurses from each hospital through the CNE

or designee. The letters were distributed through the hospital's interoffice mail system or e-mail depending on the preference of the organization. The introductory letter to the registered nurses also provided information on the website where registered nurses could complete the survey on-line. A postage paid return envelope was included along with the printed survey and respondents were asked to return the completed survey directly to the researcher. Appendix 2 includes the introductory letter and printed survey that were distributed to the registered nurses in each hospital. After two weeks, a reminder email was delivered to all members of the sample of registered nurses through the CNE or designee as a reminder to return the printed survey or access the survey on-line and to thank those who have already responded (Dillman, 1978).

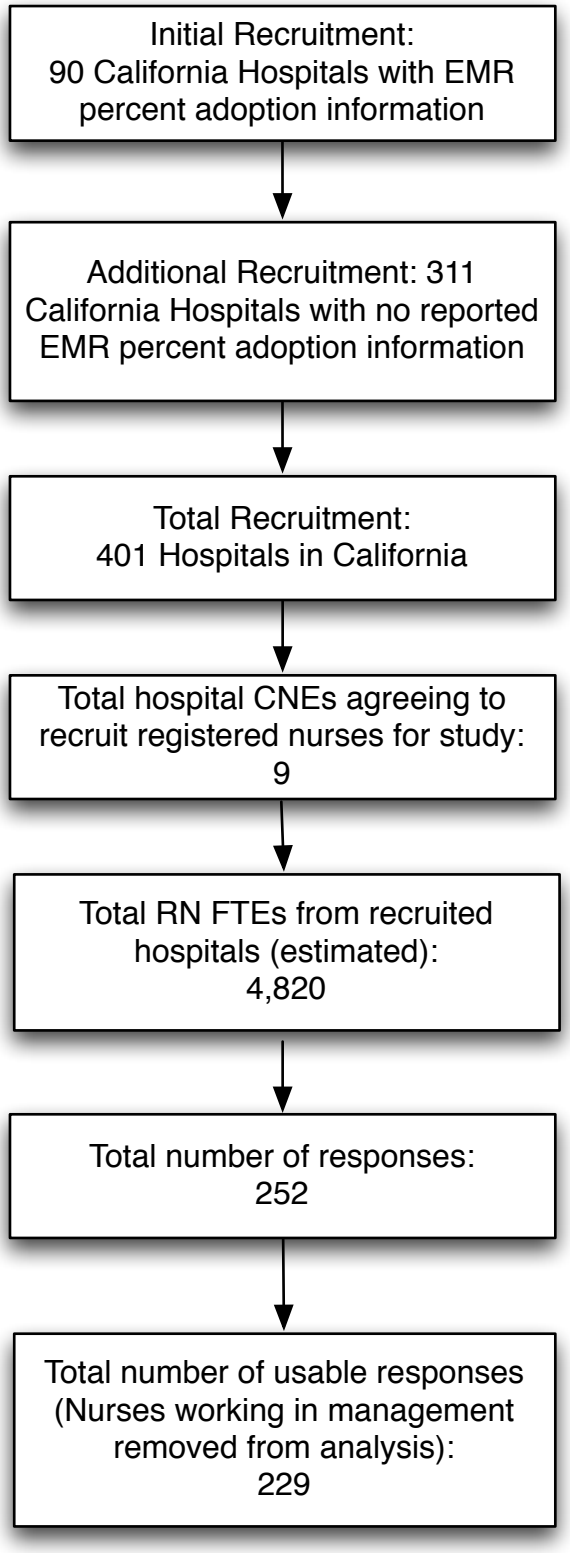

Figure 7. Recruitment of registered nurses from California hospitals.

Response Rate

The actual response rate was not calculated because the participating hospitals did not report the number of nurses who received the survey. However, the total RN productive FTE based on 2012 data from the California OSHPD Annual Financial Data report is shown in Table 2 to provide perspective on the number of nurses in each participating hospital. Productive RN Full Time Equivalent (FTE), however, may not be an accurate reflection of the total number of nurses in the participating organization at a given time as nurses are hired and leave the organization at any point in time. Also, part-time, and per-diem nurses could only be partially counted in the FTE. For example, some organizations count each per-diem or intermittent employee as 0.1 FTE. An estimated response rate was calculated and fell on the lower bound because productive RN FTEs were used and not the actual number of RNs in the organization. A total of 252 registered nurses responded for this study. Data from nurses who worked in management were removed leaving a total of 229 usable responses. The estimated response rate for this study was 5.09%. Paper responses might have offered a better response rate compared to the on-line survey as previous studies have found better response rates with paper surveys (Nulty, 2008) even with the multiple advantages offered by on-line surveys.

Table 2

Estimated Response Rates by Hospital and Total

Hospital	Productive RN FTE*	N	Estimated Response Rate
A	155.97	23	14.75%
B	212.58	24	11.29%
C	1647.40**	24	1.50%
D	86.51	29	33.52%
E	1241.36**	20	1.61%
F	388.89	40	10.29%
G	397.69**	62	15.59%
Others***	413.61	7	1.89%
Total	4501.69	229	5.09%

* Data from OSHPD Healthcare Information Division Annual Financial Data 2012
**FTE based on whole hospital system however recruitment was for one campus of system only but productive RN FTE data is not available by campus.
*** Data from two hospitals with low response rates and from those RNs with no hospital name reported

Data Collection and Instrumentation

Data were collected through a paper survey or through a web-based survey hosted by Qualtrics ® from May 1, 2012 to December 31, 2012. Paper surveys were returned via a postage paid return envelope. Web-based surveys were downloaded and converted to an excel spreadsheet. Paper-based surveys were entered into the same excel spreadsheet. The excel spreadsheet was then imported into STATA/SE 12.1 for Mac.

The questionnaire constructed for this study included items from the instruments described below along with personal demographic variables. The last question invited respondents to write any comments they wanted to share with the researcher. There were a total of 63 questions in the study questionnaire. Cronbach's alpha analysis of the multi-item instruments was done using STATA64/SE 12.1 for Mac. Cronbach's α for the multi-item instruments used in this study ranged from 0.83 to 0.94 supporting the internal reliability of these instruments. Previous studies have shown similar reliability for these instruments.

Individual innovative behavior scale. Scott and Bruce's (1994b, 1998) individual innovative behavior scale is a 6-item survey measuring an employee's individual innovative work behavior. The questions are rated on a 5-point Likert scale ranging from 1 (not at all) to 5 (an exceptional degree). The sum of the questions divided by the total number of items is the worker's individual innovative behavior score. Higher scores indicate higher employee individual innovative work behavior. Example items include "generate creative ideas" and "promote and champion ideas to others." The survey has been used on samples of engineers, scientists, technicians, and employees from government, education, finance, construction, computing, and consulting, and has shown some evidence of reliability and validity (Carmeli et al., 2006; S. G. Scott & Bruce, 1994a, 1994b; Subramaniam, 2007). Cronbach's α from this work ranged from 0.86 to 0.89. Face and content validity of the survey was determined through interviews with the leaders of a research and development facility of a major U. S. industrial corporation. Further evidence of validity was provided in these studies by the positive relationships between individual innovative behavior and self-leadership (an individual internalized process that leads to preferred behaviors and results), role expectations, and leader-member exchange supporting the theoretical relationship between individual innovative behavior and these constructs further supporting evidence of validity for the instrument. The individual items are general in structure and appear relevant to the work of nurses. Cronbach's alpha for this study was 0.87.

Autonomy scale. The nursing autonomy scale was developed by Rafferty, Ball, and Aiken (2001) based on the Nursing Work Index (NWI). The nursing autonomy scale is a 5-item survey measuring a nurse's perception of the level of autonomy at work. The questions are rated on a 4-point Likert scale ranging from 1 (strongly agree) to 4 (strongly disagree). The sum of the

questions divided by the total number of items is the nurse's autonomy score. Lower scores indicate greater levels of autonomy in the workplace. Example items include "nursing controls its own practice" and "involvement of staff nurses in the internal governance of the hospital". The survey was used in 5,006 nurses working in hospitals in England and has shown evidence of reliability and validity (Rafferty et al., 2001). Cronbach's α from that study was 0.68. The nursing autonomy scale has shown significant and positive correlations with scales for control, relationship with physicians, decision-making, job satisfaction, and perceived quality of care, and also a significant and negative relationship with burnout. The scales for autonomy were reverse-coded for this study as the original scale coding was opposite of the other scales used in this study. This was a concern because this difference in the directionality of the scale could lead to confusion in the interpretation of the results. For this study, higher scores in the autonomy scale indicate higher perception of autonomy. Cronbach's alpha for this study was 0.83.

Multidimensional measure of leader-member exchange scale (LMX-MDM). The LMX-MDM scale is used to measure the quality of the exchange between the leader and subordinate (Liden & Maslyn, 1998). The LMX-MDM is a 12-item scale rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The sum of all the items divided by the total number of items is the scale score (Liden & Maslyn, 1998). Higher scores indicate perception of a better quality of exchange between the leader and subordinate. The LMX-MDM scale was used as a multidimensional measure in other studies but will be used as a composite measure for this study and composite use is supported by some studies (Becker, Halbesleben, & O'Hair, 2005; Liden & Maslyn, 1998; Maslyn & Uhl-Bien, 2001). Example items include "I like my supervisor very much as a person" and "I do not mind working my hardest for my supervisor". The survey was tested on a sample of working students and

organizational employees and has shown some evidence of reliability and validity (Becker et al., 2005; Davies, Wong, & Laschinger, 2011; Greguras & Ford, 2006; Liden & Maslyn, 1998; Maslyn & Uhl-Bien, 2001). Cronbach's α from previous studies ranged from 0.72 to 0.89 (Liden & Maslyn, 1998; Maslyn & Uhl-Bien, 2001). Cronbach's alpha for this study was 0.79.

Supportive climate scale. The supportive climate scale, an 8-item survey from De Jong and Kemp (2003), was developed from the team climate inventory by Anderson and West (1998). It aims to measure the level of support for innovation in the organization. The questions are rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The sum of the items divided by the total number of items is the individual's perception of the support for innovation in the organization score. Higher scores indicate higher perceived support for innovation in the organization. Example items include "assistance in developing new ideas is readily available" and "people in my work cooperate in order to help develop and apply new ideas". The survey has been used in a variety of professions including engineers, lawyers, consultants, and workers in knowledge-intensive services and has shown evidence of reliability and validity (De Jong, 2007; De Jong & Kemp, 2003). Cronbach's α from these studies ranged from 0.79 to 0.85. The supportive climate scale has shown some positive correlation to scales for vision, participative safety, task orientation, interaction frequency, innovative behavior, job challenge, autonomy, strategic attention, and external contacts providing support for the validity of the survey (De Jong & Kemp, 2003). However, this survey has not been widely used and also has not been tested in a sample of nurses. This survey was selected for this study because the items included in this survey provide a composite view of the organizational support for innovation and, although it has not been tested in registered nurses, the items appear relevant to nurses working in organizations. Cronbach's alpha for this study was 0.94.

Research use instrument. The research use instrument was developed by Champion and Leach (1989). The research use instrument is a 10-item survey attempting to capture the degree to which the nurse incorporates research findings into practice. The survey is rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Two of the items were stated negatively and were reverse coded before the mean was calculated. The sum of the items divided by the total number of items is the research utilization score of the individual. Higher scores indicate higher research utilization in practice of the registered nurse. Items include "I base my practice on research" and "I am unable to use research in my work". The research use instrument was initially tested on a convenience sample of 59 nurses from various specialties in a community hospital in the U.S. (Champion & Leach, 1989). The instrument has shown some evidence of reliability and validity in other studies (Bostrom et al., 2008; Bostrom, Kajermo, Nordstrom, & Wallin, 2009; Champion & Leach, 1989). Cronbach's α from previous studies was 0.84 to 0.92 (Bostrom et al., 2008, 2009; Champion & Leach, 1989) Attitude and availability was significantly and positively associated to research utilization supporting the theoretical relationship between research utilization and these constructs providing support for evidence of validity of the instrument (Champion & Leach, 1989). Cronbach's alpha for this study was 0.93.

Attitude towards research and belief suspension scales. The instruments for attitude towards research and belief suspension are taken from Estabrooks' (1997, 1999a, 1999b) research utilization survey. Attitude towards research is a single question rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores mean having a better attitude towards research use. The single item question is "Research makes a positive difference to patient care and outcomes". Belief suspension is a 3-item survey rated on a 5-point Likert scale ranging from 1(never) to 5 (often). The leading phrase "How often do you actually

implement research when it contradicts something you …" is followed by three questions including "Learned prior to nursing school", "Learned in nursing school", and "Learned in your place of work". The sum of the items divided by the total number of items is the belief suspension score of the individual. Higher scores mean higher belief suspension. Cronbach's α from previous studies was 0.85 to 0.87 providing evidence of reliability. The instrument also has shown evidence of validity (Estabrooks, Kenny, Adewale, Cummings, & Mallidou, 2007; Estabrooks et al., 2008; Kenny, 2005). Cronbach's alpha for this study was 0.87.

Quality of care questions. Nurses' perception of the quality of care at the hospital at which they work was measured using Aiken, et al.'s (2002) items related to quality of care. This is composed of two single-item questions on a 4-point Likert scale ranging from 1 (excellent) to 4 (poor). Lower scores for each single-item question indicate better perceived quality of patient care by the nurse (Aiken et al., 2002). The two single item questions are "In general, how would you describe the quality of nursing care delivered to your patients on your unit?" and "How would you describe the quality of nursing care delivered on your last shift?" The quality of care survey has shown evidence of validity (Aiken et al., 2002). The scores for the two quality of care questions were reverse coded for ease of interpretation. For this study higher scores on the quality of care questions indicate higher perception of the quality of care provided by the nurses.

Patient safety grade. The patient safety grade from AHRQ (2011) is a single-item question rated on a 5-letter grade Likert scale, with responses ranging from A (excellent) to F (failing) (the letter E is skipped). 'A' means that nurses perceive the hospital to have excellent patient safety and is assigned a score of four while an 'F' rating means that nurses perceive the hospital to be failing in patient safety and is assigned a score of zero. The higher the score the better the perceived patient safety for the organization. The single item question is "Please give

your work area/unit in this hospital an overall grade on patient safety". The patient safety grade has shown evidence of validity (Blegen, Gearhart, O'Brien, Sehgal, & Alldredge, 2009; Halbesleben, Wakefield, Wakefield, & Cooper, 2008). This was coded as F=0, D=1, C=2, B=3, and A=4.

In-services and continuing education. In-services and continuing education (CE) are workshops, lectures, and other educational opportunities designed to keep practicing professionals abreast of the latest development in their fields (ITEEA, 2011). For this study, it is the self-reported total number of in-service and continuing education events that a nurse has attended in the past 12 months.

Hospital name. This information was provided by the registered nurses and was a free-form text entry in the questionnaire. This information was needed in order to categorize hospital innovativeness, type of control, bed size, and productive RN Full-Time Equivalent (FTE).

Demographics. Demographic attributes were collected through the questionnaire and included age, years as registered nurse, years in current position, gender, employee status, role, specialty certification, level of education, clinical area, and response type. All of these demographic characteristics were self-reported by the respondents except for response type which was determined by how the respondent sent back the survey. Age was reported in years. Length in current position and as registered nurse was reported in years. Gender choices were male and female. Employment status choices included full-time, part-time, per-diem, and other. Role choices included staff nurse, charge nurse, nurse manager, nurse director/executive, clinical nurse specialist, and other. Highest level of education choices included associate's, bachelor's, master's, doctoral degrees, and other. Clinical area included a total of 16 choices; for example medical/surgical, telemetry, and geriatrics. Specialty certification is whether or not the nurse has

passed a pre-determined standard in a defined functional or clinical area in nursing such as the CCRN® (American Association of Critical Care Nurses, 2013). Choices for specialty certification were yes and no. Response type was determined by how the respondent answered the questionnaire – whether by paper or on-line.

Hospital innovativeness. Registered nurses were stratified based on their self-reported hospital. The hospitals were categorized according to the HIMSS Analytics Database (The Dorenfest Institute for H.I.T. Research and Education, 2010). The 2009 HIMSS Analytics database contains demographic and IT data from over 33,000 facilities of which 5,168 are hospitals. Information that was included in the 2009 database included the percent range of the hospital's current medical record that was electronic (includes digital and/or scanned data). The ranges were 1 - 25%, 26 - 50%, 51-75%, and 76-100%. This information was used to categorize hospitals by degree of innovativeness. 1-50% EMR adoption hospitals were considered as low innovativeness hospitals, 51-75% were categorized as medium innovativeness hospitals, and 76-100% EMR adoption hospitals were considered as high innovativeness hospitals. Empty EMR adoption data corresponds to "not reported" by the organization (A. Zupancic, personal communication, February 8, 2011) and was coded as a missing item for this study.

Hospital size and productive RN full time equivalent (FTE). The California Office of Statewide Health Planning and Development (OSHPD) was created in 1978 to provide the state with information about the status of healthcare infrastructure. Hospital data collected by OSHPD included both quality and financial data. Annual financial data reports were required to be submitted by California licensed hospitals within four months of their fiscal accounting year-end. These financial reports were based on a uniform accounting and reporting system developed, maintained, and audited by OSHPD. The Complete Set of Hospital Annual Financial data

contained desk-audited data collected from acute care hospitals licensed by the State of California. The information collected included type of control, number of licensed beds, available beds, staffed beds, balance sheets and income statements, revenues by payer, and expenses by natural classification, as well as productive RN FTE. The latest version available on the website is the 37th year (2011 - 2012). Hospital size is the total number of licensed beds which a hospital has been designed and constructed to contain (Reference.MD, 2012). Hospital size was coded as small for 1 to 99 licensed beds, medium for 100 to 149 beds, and large for those with greater than or equal to 150 licensed beds as reported on the California Hospital Annual Financial data 36th year.

Data Entry

Data from both the paper and electronic surveys were entered into an excel spreadsheet. This excel spreadsheet was then imported into STATA64/SE 12.1 for Mac. The imported data was subsequently audited for accuracy against the original paper and electronic surveys. Data were coded based on the original coding of the instruments. Items that needed reverse coding were reversed after initial entry. Missing items were coded with a '.'.

Data Analysis

There were a total of 252 questionnaires received. Twenty-three of the respondents responded that they were in management positions and thus were excluded from the analysis. This brought the total usable questionnaires to 229. There were missing items for the major variables as well as the demographic characteristics of the respondents and these are summarized in Table 3. Only a total of 88 questionnaires had complete data. However, data from all 229 responses were included in the data analyses.

Scoring. Mean scores were first calculated for the multi-item scales. If the instrument had an item response rate of less than 80 percent, the mean was not calculated and the scale was marked as a missing item for the respondent. For example, if a respondent answered only 3 of the 5 items in the individual innovative behavior scale the mean score for the respondent was not calculated and was marked as a missing item.

Table 3

Percent of Non-missing and Missing Items by Variable

Variables	Non-missing Items (%)	Missing Items (%)
Individual Innovative Behavior	226 (99.0%)	3 (1.0%)
Autonomy	221 (96.5%)	8 (3.5%)
Leader-member Exchange	209 (91.3%)	20 (8.7%)
Support for Innovation	203 (88.6%)	26 (11.4%)
Research Utilization	198 (86.5%)	31 (13.5%)
Quality of nursing care in unit	196 (85.6%)	33 (14.4%)
Quality of nursing care last shift	191 (83.4%)	38 (16.6%)
Belief Suspension	193 (84.3%)	36 (15.7%)
Attitude Towards Research	197 (86.0%)	32 (14.0%)
Age	181 (79.0%)	48 (21.0%)
Gender	185 (80.8%)	44 (19.2%)
Hospital Name	222 (96.9%)	7 (3.1%)
Employment Status	186 (81.2%)	43 (18.8%)
Level of Education	184 (80.3%)	45 (19.7%)
Clinical Area	181 (79.0%)	48 (21.0%)
Specialty Certification	181 (79.0%)	48 (21.0%)
Total number of in-services and CE	169 (73.8%)	60 (26.2%)
EMR adoption	130 (56.8%)	99 (43.2%)
Size	222 (96.9%)	7 (3.1%)

Categorical variables. Sub-categories of employee status, role, education, and clinical area were combined because of low responses for some sub-categories. Employee status sub-categories were combined into full-time and non-full-time (part-time, per-diem, and others). Education sub-categories were combined into less than a Bachelor's degree (associate degree and diploma), Bachelor's, and Graduate (master's and doctoral degrees) categories. Clinical area sub-categories were combined into non-critical care (medical-surgical, geriatrics, obstetrics, oncology, telemetry, and psychiatry and mental health) and critical care (neonatal/newborn,

intermediate care, perioperative, emergency, critical care, step-down and transitional care). Responses marked as 'other' were individually inspected to determine the sub-category. If the respondent noted that part of their clinical area was critical care then that response was entered into critical care. The following sub-categories were coded as '0': non-full-time, less than a Bachelor's degree, and non-critical care. Categorical variables with yes/no responses were coded '0' for no and '1' for yes. The variable hospital control was removed from the analysis because nearly all of the respondents (96.9%) came from non-profit hospitals.

Data analysis by specific aims. The data were analyzed based on the specific aims for this study. First, a descriptive analysis was done to answer the first specific aim. Second, multiple linear and logistic regression analysis were done to answer the second and third specific aims. Significance level was set at $P<.05$. Additionally, hierarchical multiple linear and logistic regression was used to determine whether individual innovative behavior or research utilization were mediating variables in the model.

The specific aims of this study were to:

1. Describe individual innovative behavior, research utilization, autonomy, leader-member exchange, support for innovation, and the quality and safety of patient care (major variables) among registered nurses working in acute care hospitals. These major variables were described through the use of descriptive statistics including means, standard deviations, medians, maximums, and minimums. (StatSoft, Inc., 2011). One-way analysis of variance as well as Pearson correlations was also used to describe the relationships among the major variables. A post-hoc Bonferroni analysis was done for those categories that showed significant differences and had 3 or more sub-categories.

2. Describe the relationships among the antecedent variables, individual innovative behavior, and research utilization. Multivariate linear regression was used to determine these relationships. Multivariate linear regression is a statistical technique used to predict an outcome from several predictors. Multivariate regression analyses were conducted to identify the best combination of variables explaining the total variance in individual innovative behavior and research utilization. Nested regression was also used to determine the contribution of multiple blocks of variables. Nested regression involved entering sequential blocks of variables into the equation and helps the contribution of each block of variables. Because respondents were clustered within hospitals, it seemed likely that errors were not independent. Clustering was specified in the analysis to control for the effect of clustering within hospitals. This provided for a more conservative t-value as reflected in the robust standard errors. Robust standard errors were computed in order to account for the possibility that the errors of the regression were not independent and identically distributed. The assumptions of multivariate linear regression were checked. These assumptions included independence of measurement, normality, linearity, reliability of measurement, and homoscedasticity. The continuous variables were also examined for high correlations.
3. Describe the relationships among individual innovative behavior, research utilization and the quality and safety of patient care. Logistic regression was used to determine these relationships. Logistic regression is a statistical technique used to model dichotomous outcome variables (Acock, 2012). Nested regression was also used to determine the contribution of multiple blocks of variables. Clustering was also specified for this analysis. The dependent variables quality of nursing care in unit as well as patient safety grade was dichotomized for this analysis. Scores of 4 were coded as high (1) and scores of 3 and below

were coded as low (0) for quality of nursing care in unit. Grade of A was coded as high (1) and grades of B and below were coded as low (0) for patient safety grade.

Summary

The main goal of this study was to describe registered nurse individual innovative behavior. Corollary to this goal was to understand the relationships of individual innovative behavior to other variables present in the work environment of nurses. The methods described in this chapter provided this researcher with the process to answer the questions hypothesized in this research proposal.

CHAPTER 4

RESULTS

The purpose of this chapter is to provide the results of the analysis of data. This chapter is organized as follows: 1) the descriptive characteristics of the respondents are summarized, 2) the specific aims and associated hypotheses are repeated for clarity, 3) the analysis of data is presented for each hypothesis, 4) a determination is made whether individual innovative behavior or research utilization act as mediating variables, and 5) a summary of the data analysis is provided.

Descriptive Characteristics of Hospitals

A total of 9 acute care hospitals agreed to participate in this study with their Chief Nurse Executives agreeing to facilitate the recruitment of registered nurses from their respective hospitals. All but one was a non-profit hospital. Two were teaching hospitals. One was a city/county hospital. A breakdown of hospital characteristics and registered nurse demographic variables per hospital is shown in Table 4. Two hospitals with low response rates as well as those respondents who did not report the hospital they worked for were included in the category ‘others’. Of the 9 hospitals in the study, two were small hospitals, two were medium, and five were large; and only 4 had information on EMR implementation in the HIMSS database. One was a low innovativeness hospital, one a medium innovativeness hospital, and two were high innovativeness hospitals. Hospital innovativeness was used in the analysis of variance comparison but, due to missing data, was not included in the regression analysis.

Table 4

Description of Hospitals and Registered Nurses by Hospital

Variable	A	B	C	D	E	F	G	Others	All Respon-dents	All CA RNs*
					Hospital Level					
% EMR Adoption (Hospital Innovative-ness)	N.A.	1-25% (Low)	76-100% (High)	N.A.	51-75% (Med-ium)	N.A.	76-100% (High)	N.A.		
Hospital Bed Size	102	135	660	35	844	180	313	159-475		
					Nurse Level Mean (SD) [N]					
Age in years	44.52 (10.70) [23]	50.48 (11.55) [21]	41.26 (11.36) [19]	46.32 (11.44) [25]	41.63 (11.89) [16]	46.07 (9.78) [27]	45.30 (12.08) [50]	- (-) [0]	45.31 (11.44) [181]	46.1
Years as RN	18.05 (12.88) [21]	16.85 (10.87) [20]	14.74 (10.72) [19]	13.79 (9.93) [24]	13.47 (10.39) [16]	15.74 (10.81) [27]	17.93 (11.84) [50]	25.00 (-) [1]	16.23 (11.16) [178]	N.A.
Years in current position	10.16 (12.27) [19]	13.05 (8.54) [20]	9.03 (9.80) [17]	9.75 (8.00) [24]	9.51 (8.72) [16]	10.94 (7.07) [26]	12.10 (10.06) [50]	20.00 (-) [1]	11.00 (9.28) [173]	8.9
					Percent [N]					
Female	78% [18]	95% [20]	90% [18]	92% [23]	94% [15]	97% [28]	94% [47]	100% [1]	92% [170]	88.4%
Full-Time	39% [9]	80% [16]	25% [5]	92% [24]	94% [15]	43% [13]	76% [38]	100% [1]	65% [121]	N. A.
Less than a Bachelor's degree	30% [7]	37% [7]	10% [2]	46% [12]	0% [0]	43% [12]	20% [10]	100% [1]	28% [51]	46.8%
Bachelor's Degree	65% [15]	53% [10]	50% [10]	46% [12]	69% [11]	43% [12]	68% [34]	0% [0]	57% [104]	42.3%
Graduate Degree	4% [1]	11% [2]	40% [8]	11% [2]	31% [5]	14% [4]	12% [6]	0% [0]	15% [28]	10.9%
Work in Critical Care Areas	95% (21)	57% (12)	25% (5)	56% (14)	25% (4)	72% (21)	63% (30)	0% (0)	59% (107)	29%
Specialty Certification	22% (5)	26% (5)	35% (7)	42% (10)	44% (7)	32% (9)	68% (34)	0% (0)	43% (77)	N.A.

N.A. = Not available, - = no data
*Data from the 2012 Survey of Registered Nurses in California
SD = standard deviation, N = sample size

Description of Registered Nurses

The population of Registered Nurses from 9 hospitals in California was recruited for this study. A total of 229 survey responses were included in the analysis; fifty-nine (25.8%) were paper surveys and 170 (74.2%) were completed on-line. The registered nurses in this study were mostly female (92%), and worked full-time (65%) in critical care areas (59%). Most had a Bachelor's degree (57%) and did not have specialty certification (57%). There were a total of 181 nurses who responded to the question about specialty certification. There were 104 who responded 'no' and 77 who responded 'yes'. Of those who responded 'yes', 25% were certified in critical care and 12% were certified in Medical-Surgical. The mean age was 45.3 years, the mean years as registered nurse was 16.2, and the mean years in current position was 11.0.

Data for all licensed registered nurses from the 2012 Survey of Registered Nurses in California was included in Table 4 for comparison (Spetz, Keane, Chu, & Blash, 2013). The respondents for this study were about the same age as the CA BRN survey respondents (45.31 vs. 46.1 years). There were more female respondents for this study (92% vs. 88.4%). Also, there were more Bachelor's prepared (57% vs. 42.3%) and graduate degree (15% vs. 10.9%) registered nurses compared to the CA BRN respondents. A large number of respondents for this study worked in critical care (59% vs. 29%).

Specific Aims and Associated Hypotheses

The specific aims and associated hypotheses of this study were to:

1. Describe individual innovative behavior, research utilization, autonomy, leader-member exchange, support for innovation, and the quality and safety of patient care (major variables) among registered nurses working in acute care hospitals.

2. Describe the relationships between the antecedent variables – autonomy, leader-member exchange, support for innovation-, individual innovative behavior, and research utilization.
    a. Hypothesis 1: Better autonomy, leader-member exchange and support for innovation increase individual innovative behavior among registered nurses who work in acute care hospitals, controlling for covariates.
    b. Hypothesis 2: Better individual innovative behavior increases research utilization among registered nurses who work in acute care hospitals, controlling for covariates.
3. Describe the relationships of individual innovative behavior, research utilization and the quality and safety of patient care.
    a. Hypothesis 3: Better individual innovative behavior and research utilization increases the likelihood of perceived high quality of patient care.
    b. Hypothesis 4: Better individual innovative behavior and research utilization increases the likelihood of perceived high safety of patient care.

Analysis of Data

Aim 1: Describe the major variables. Mean, standard deviation, median, and range (minimum and maximum) were used to describe the major variables (Table 5). One-way analysis of variance (ANOVA) as well as Pearson correlations were used to analyze the relationships among the major variables. Table 6 presents the analysis of variance, degrees of freedom, F statistic, means and the standard deviations of the major variables by the categories of certification and level of education for the nurse respondents. Other categorical variables used to make comparisons include response type, gender, employee status, clinical area, and hospital

size are presented in the body of the text if the results were significant but are not presented in any of the tables. Table 7 presents the Pearson correlations of the major variables. A separate section for hospital innovativeness is presented to describe whether hospital innovativeness affects nurse responses to the major variables (Table 8).

Table 5

Descriptive Statistics of Major Variables

Variables (No. of items in instrument)	Scale	Mean (SD)	Median (Min, Max)
Individual Innovative Behavior (6)	1=not at all, 5=to an exceptional degree	3.13 (0.68)	3.17 (1.17, 4.83)
Research Utilization (10)	1=strongly disagree, 5=strongly agree	3.88 (0.64)	3.90 (1, 5)
Autonomy (5)	1=strongly disagree, 4=strongly agree (original scale reversed)	3.08 (0.63)	3.20 (1, 4)
Leader-Member Exchange (12)	1=strongly disagree, 7=strongly agree	5.33 (1.35)	5.67 (1, 7)
Support for Innovation (8)	1=strongly disagree, 5=strongly agree	3.36 (0.79)	3.40 (1, 5)
Quality of Nursing Care, Unit (1)	1=poor, 4=excellent (original scale reversed)	3.56 (0.59)	4.00 (2, 4)
Quality of Nursing Care, Last Shift (1)	1=poor, 4=excellent (original scale reversed)	3.56 (0.60)	4.00 (2, 4)
Patient Safety Grade (1)	0=F, 4=A	3.20 (0.77)	3.00 (1, 4)

Individual innovative behavior. Registered nurses reported, on average, moderate individual innovative behavior (3.13 on the 5 point scale). When registered nurses were categorized according to whether they had specialty certification or not, those who were certified reported higher individual innovative behavior compared to those who were not (Table 6). Education appears to also play a role in individual innovative behavior. Registered nurses with graduate education reported higher individual innovative behavior compared to those who only had an associate degree or diploma in nursing. Categorical variables that did not show any

differences in individual innovative behavior scores included gender, employee status, clinical area and hospital size. Individual innovative behavior was correlated with research utilization, autonomy, and leader-member exchange at statistically significant but only weak or moderate positive levels (Table 7). There was a weak negative correlation with age. Older registered nurses reported lower individual innovative behavior scores. There was no significant correlation found between individual innovative behavior and support for innovation, quality of nursing care in unit, quality of nursing care last shift, and patient safety grade. It is interesting that individual innovative behavior does not appear to play a role in the perceptions of care quality and safety.

Research utilization. Registered nurses reported that they were moderately committed to using research in nursing practice (3.88 on a 5 point scale). However, there were no significant differences found in research utilization when registered nurses were categorized by certification or education (Table 6). Research utilization was found to have a significant weak to moderate positive correlation with most of the major variables (Table 7). The only research utilization correlation that was not significant was with the quality of nursing care on the last shift worked. There was a weak negative correlation with age. Again, older nurses reported lower research utilization scores.

Autonomy. Registered nurses reported moderate levels of autonomy (3.08 on a 4 point scale). There were no differences by certification or education (Table 6). Differences in autonomy were found when registered nurses were categorized according to hospital size. Respondents from large hospitals reported higher autonomy scores (M=3.18, SD=0.53) compared to registered nurses from small hospitals (M=2.88, SD=0.63) [$F(2, 214) = 3.63$, $P < .05$] (data not presented in table). Autonomy had significant weak positive correlations with

most of the major variables (Table 7). Age was negatively correlated with autonomy. Older nurses reported lower autonomy scores.

Table 6

Differences, Means and Standard Deviations for Certification and Level of Education Categories (ANOVA)

	Certification Mean (SD) [N]			Level of Education Mean (SD) [N]			
	Degrees of freedom (F statistic)	Yes	No	Degrees of freedom (F statistic)	Less than a Bachelor's Degree	Bachelor's Degree	Graduate Degree
Individual Innovative Behavior	1, 177 (9.57**)	3.29 (0.58)+ [77]	2.98 (0.71)+ [102]	2, 178 (7.21**)	2.87 (0.69)+ [49]	3.13 (0.63) [104]	3.46 (0.71)+ [28]
Research Utilization	1, 178 (2.61)	3.98 (0.56) [77]	3.82 (0.71) [103]	2, 178 (1.17)	3.82 (0.66) [49]	3.88 (0.53) [104]	4.06 (0.98) [28]
Autonomy	1, 178 (0.03)	3.05 (0.61) [77]	3.07 (0.67) [103]	2, 179 (0.63)	2.98 (0.58) [50]	3.10 (0.67) [104]	3.06 (0.66) [28]
Leader-Member Exchange	1, 176 (0.62)	5.23 (1.41) [77]	5.40 (1.37) [101]	2, 177 (0.60)	5.35 (1.34) [49]	5.28 (1.45) [103]	5.61 (1.24) [28]
Support for Innovation	1, 178 (0.09)	3.41 (0.82) [77]	3.37 (0.74) [103]	2, 179 (0.30)	3.34 (0.85) [50]	3.38 (0.73) [104]	3.47 (0.72) [28]
Quality of Nursing Care in Unit	1, 178 (0.72)	3.61 (0.59) [77]	3.53 (0.61) [103]	2, 179 (1.75)	3.64 (0.56) [50]	3.51 (0.61) [104]	3.71 (0.53) [28]
Quality of Nursing Care Last Shift	1, 175 (0.15)	3.58 (0.59) [77]	3.55 (0.58) [100]	2, 176 (1.04)	3.62 (0.61) [47]	3.52 (0.57) [104]	3.68 (0.55) [28]
Patient Safety Grade	1, 178 (0.00)	3.18 (0.76) [77]	3.18 (0.80) [103]	2, 179 (1.37)	3.22 (0.84) [50]	3.13 (0.76) [104]	3.39 (0.69) [28]

* p <.05, ** p <.01
+ Bonferroni post-hoc analysis p<.05, sub-categories with differences
SD = standard deviation, N = sample size

Table 7

Pearson Correlation of Major Variables and Age

	1	2	3	4	5	6	7	8	9
1. Individual Innovative Behavior	1.00								
2. Research Utilization	0.35***	1.00							
3. Autonomy	0.27***	0.27***	1.00						
4. Leader-Member Exchange	0.17*	0.17*	0.24***	1.00					
5. Support for Innovation	0.14	0.34***	0.42***	0.26***	1.00				
6. Quality of Nursing Care in Unit	0.08	0.19**	0.21**	0.17*	0.37***	1.00			
7. Quality of Nursing Care Last Shift	0.06	0.09	0.22**	0.19*	0.26**	0.68***	1.00		
8. Patient Safety Grade	0.01	0.17*	0.29***	0.17*	0.40***	0.69***	0.53***	1.00	
9. Age	-0.21**	-0.17*	-0.19*	-0.01	-0.05	0.10	0.04	0.09	1.00

* p <.05, ** p <.01, *** p <.001
Diagonal is correlation with itself
Years as registered nurse and years in current position not shown, significant correlations only to each other and age

Leader-member exchange. Registered nurses reported moderately healthy leader-member exchange (5.34 on a 7 point scale). Differences in leader-member exchange were found when registered nurses were categorized according to employee status. Registered nurses who were not full-time reported higher leader-member exchange scores (M=5.63, SD=1.21) compared to nurses who worked full-time (M=5.20, SD=1.45) [F (1, 181) = 4.08, P < .05] (data not presented in tables). Leader-member exchange had small to medium correlation with most of the major variables (Table 7). There was no significant correlation found with age.

Support for innovation. Registered nurses reported support for innovation as moderately present in the study hospitals (3.36 on a 5 point scale). There were no significant differences found in support for innovation by registered nurse respondent's certification or level of

education (Table 6). Support for innovation had significant weak to moderate correlations with most of the major variables except for individual innovative behavior and age (Table 7). An interesting finding was that support for innovation was not correlated with individual innovative behavior.

Quality of patient care. Registered nurses reported that quality of nursing care in their unit and on their last shift was good on average (both at 3.56 on a 5 point scale). None of the registered nurses reported that the quality of nursing care in their unit or on their last shift was poor. Critical care nurse reported higher quality in nursing care in their unit (M=3.64, SD=0.57) compared to nurses who did not work in critical care units (M=3.45, SD=0.62) [F (1, 179) = 4.93, P < .05] (data not presented in tables). Registered nurses from large hospitals reported a higher quality of nursing care in unit (M=3.69, SD=0.50) compared to registered nurses from medium hospitals (M=3.42, SD=0.70) [F (2, 190) = 4.00, P < .05] (data not presented in tables). Quality of nursing care in unit had a weak to moderate positive correlation with research utilization, autonomy, leader-member exchange, and support for innovation; and a high positive correlation with quality of nursing care last shift as well as patient safety grade (Table 7). There was no significant difference in quality of nursing care last shift when registered nurses were grouped into the study categories except for hospital size. Registered nurses from large hospitals reported higher quality of nursing care last shift (M=3.68, SD=0.50) compared to registered nurses from medium hospitals (M=3.41, SD=0.68) [F (2, 185) = 3.99, P < .05] (data not presented in tables). Quality of nursing care last shift had significant weak to moderate positive correlation with autonomy, leader-member exchange, and support for innovation (Table 7). It had a strong positive correlation with quality of nursing care in unit as well as patient safety grade.

Safety of patient care. Registered nurses on average rated the patient safety grade as a 'B'. It is interesting to note that none of the registered nurses rated their hospitals with a patient safety grade of 'F'. Critical care nurses reported higher patient safety grades (M=3.32, SD=0.73) compared to nurses who did not work in critical care units (M=3.00, SD=0.81) [F (1, 179 = 7.52, P < .01] (data not presented in tables). Patient safety grade had a weak to moderate positive correlation with research utilization, autonomy, leader-member exchange, and support for innovation (Table 7). It had a strong positive correlation with quality of nursing in unit as well as last shift.

Hospital innovativeness. There were differences in individual innovative behavior and leader-member exchange when registered nurses were grouped according to hospital innovativeness (Table 8). Registered nurses from 4 hospitals were included in this analysis. One hospital was a low innovativeness hospital, one a medium innovativeness hospital, and two were high innovativeness hospitals. Registered nurses from medium innovativeness hospitals reported higher individual innovative behavior scores (M=3.56, SD=0.62) compared to registered nurses from either low (M=2.98, SD=0.82) or high (M=3.06, SD=0.63) innovativeness hospitals [F (2, 127) = 5.22, P < .01]. Registered nurses from medium innovativeness hospitals reported higher leader-member exchange scores (M=6.09, SD=1.08) compared to nurses from high (M=5.11, SD=1.36) innovativeness hospitals [F (2, 117) = 3.68, P < .05]. These were both unexpected findings as it was expected that registered nurses from high innovativeness hospitals would also have high individual innovative behavior. There were no significant differences in research utilization, autonomy, support for innovation, quality in nursing care in unit and on the last shift, as well as the patient safety grade when registered nurses were grouped according to hospital innovativeness.

Table 8

Differences, Means and Standard Deviations for Major Variables by Hospital Innovativeness (ANOVA)

Variables	Degrees of freedom (F statistic)	Hospital Innovativeness Mean (SD) [N]		
		Low (1-25% EMR adoption)	Medium (51-75% EMR adoption)	High (76-100% EMR adoption)
Individual Innovative Behavior	2, 127 (5.22**)	2.98 (0.82)+ [24]	3.56 (0.62)+~ [20]	3.06 (0.63)~ [86]
Research Utilization	2, 111 (2.50)	3.70 (0.94) [22]	4.20 (0.55) [16]	3.83 (0.66) [76]
Autonomy	2, 125 (2.74)	3.00 (0.63) [23]	3.39 (0.44) [19]	3.13 (0.55) [86]
Leader-Member Exchange	2, 117 (3.68*)	5.23 (1.36) [23]	6.09 (1.08)+ [16]	5.11 (1.36)+ [81]
Support for Innovation	2, 115 (1.69)	3.60 (0.75) [22]	3.64 (0.56) [16]	3.34 (0.82) [80]
Quality of Nursing Care in Unit	2, 109 (0.37)	3.62 (0.67) [21]	3.75 (0.45) [16]	3.63 (0.51) [75]
Quality of Nursing Care Last Shift	2, 107 (1.04)	3.57 (0.60) [21]	3.81 (0.40) [16]	3.64 (0.51) [73]
Patient Safety Grade	2, 108 (1.97)	3.29 (0.90) [21]	3.56 (0.73) [16]	3.15 (0.73) [73]

* p <.05, ** p <.01
+,~ Bonferroni post-hoc p<.05, sub-categories with differences
SD= standard deviation, N = sample size

Aim 2: Multivariate linear regression analysis. The second aim was to describe the relationships between the antecedent variables, individual innovative behavior, and research utilization. A clustered multivariate linear regression analysis was used to test this hypothesis. The assumption of independence of observations was met, as the independent variables included in the analysis were not a combination of the other independent variables. An inspection of the correlations of the variables did not find any extremely high correlations (see Table 7). The variable inflation factor (VIF), a test for multicollinearity, also determined that the assumption for lack of multicollinearity was met. VIFs were less than two for all variables included in the model. Assumptions of normality, linearity, and homoscedasticity were inspected with histograms, residuals, and scatterplots and all assumptions were satisfied.

Hypothesis 1*: Better autonomy, leader-member exchange and support for innovation increase individual innovative behavior among registered nurses who work in acute care hospitals adjusting for covariates.* Preliminary analyses found significant correlations between individual innovative behavior, age, autonomy, and leader-member exchange, and thus these variables were included in the regression model. Support for innovation was included because of theoretical relevance even if there was a non-significant correlation with individual innovative behavior in the preliminary analysis. In-services and continuing education, attitude towards research, and belief suspension were included because of previous positive relationships with research utilization. Certification and education were included because of significant differences found in individual innovative behavior when registered nurses were grouped into these categories. A nested multivariate regression analysis with cluster option was specified to analyze this hypothesis. Demographic variables were entered first. Then the continuous variables of

autonomy, leader-member exchange, and support for innovation were added into the model. In-services and continuing education, attitude towards research, and belief suspension, followed this. The dummy variable hospital size was then entered into the model. Reference categories for the categorical variables were registered nurses who were not certified, those with less than a bachelor's degree, and small hospitals. A total of 152 observations were included in the regression analysis.

The hypothesis "better autonomy, leader-member exchange and support for innovation increase individual innovative behavior among registered nurses who work in acute care hospitals adjusting for covariates" was partially supported. In the nested multivariate regression analysis (Table 9), autonomy was a significant predictor of individual innovative behavior but leader-member exchange and support for innovation were not statistically significant (Table 9, Model 4). A bachelor's degree was initially statistically significant (Table 9, Model 1) but the addition of the antecedent variables into the model (Table 9, Model 2) negated this effect. Specialty certification and belief suspension were statistically significant in the final model (Table 9, Model 4). The final overall model (Table 9, Model 4) explained 24.71% of the variance in individual innovative behavior. Registered nurses certified in their specialty were more innovative (B = 0.231) compared to non-certified nurses, controlling for other variables in the model ($P < 0.05$. For every one unit change in autonomy there was a corresponding 0.162 change in individual innovative behavior controlling for other variables in the model. For every one unit change in belief suspension there was a corresponding 0.112 change in individual innovative behavior controlling for other variables in the model. The change in r-squared was significant from model 1 to model 2 and model 2 to model 3 but not for model 3 to model 4 (Table 9).

Table 9

Multivariate Linear Regression Analyses for Variables Predicting Individual Innovative Behavior (N=152)

	Model 1		Model 2		Model 3		Model 4	
Variables	Unstandardized β	RSE	Unstandardized β	RSE	Unstandardized β	RSE	Unstandardized β	RSE
Constant	3.368 ***	0.302	2.289**	0.553	2.028**	0.531	2.076**	0.517
Age	-0.011	0.007	-0.009	0.006	-0.010	0.007	-0.010	0.007
Critical Care Areas[a]	-0.022	0.090	-0.013	0.091	-0.012	0.089	-0.039	0.066
Bachelor's Degree[b]	0.167*	0.067	0.149	0.081	0.166	0.089	0.147	0.092
Graduate Degree[b]	0.364	0.208	0.346	0.160	0.338	0.155	0.345	0.147
Specialty Certification[c]	0.267	0.111	0.269*	0.101	0.252	0.105	0.231*	0.091
Autonomy			0.220**	0.055	0.188*	0.052	0.162*	0.056
Leader-Member Exchange			0.054	0.057	0.052	0.056	0.056	0.061
Support for Innovation			0.020	0.110	0.024	0.101	0.023	0.098
In-services and CE					0.001	0.005	0.001	0.004
Attitude Towards Research					-0.016	0.072	-0.025	0.071
Belief Suspension					0.120**	0.018	0.112**	0.020
Medium Hospital[d]							0.130	0.156
Large Hospital[d]							0.202	0.119
R^2	0.1288		0.2076		0.2355		0.2471	
R^2 change			0.0789*		0.0278***		0.0116	

*p < .05, **p < .01, ***p < .001

RSE: Robust standard error, adjusted for 7 hospital clusters

Reference categories: [a]Non-critical care areas; [b]less than a Bachelor's degree; [c]no specialty certification; [d]small hospitals for hospital size.

Hypothesis 2*: Better individual innovative behavior increases research utilization among registered nurses who work in acute care hospitals, controlling for covariates.* This hypothesis was fully supported. Preliminary analysis showed that autonomy, leader member exchange and support for innovation were significantly correlated with research utilization. A nested multivariate regression analysis with robust standard errors was used to test this hypothesis. In the multivariate regression analysis, autonomy, and leader-member exchange were not significant predictors of research utilization (Table 10, Model 5). The overall final model explained 41.83% of the variance in research utilization. For every one unit increase in in-services and continuing education, there was a corresponding 0.004 increase in research utilization, controlling for other variables in the model ($P < 0.05$). For every one unit increase in attitude towards research, there was a corresponding 0.312 increase in research utilization, controlling for other variables in the model ($P < 0.01$). For every one unit increase in individual innovative behavior, there was a corresponding 0.168 increase in research utilization, controlling for other variables in the model ($P < 0.05$). The change in r-squared was significant from model 1 to 2, model 2 to 3, and model 4 to 5 (Table 10).

Table 10

Multivariate Linear Regression Analyses for Variables Predicting Research Utilization (N=152)

Variable	Model 1		Model 2		Model 3		Model 4		Model 5	
	Unstandard-ized β	RSE	Unstandard-ized β	RSE	Unstandard-ized β	RSE	Unstanard-ized β	RSE	Unstandard-ized β	RSE
Constant	4.106***	0.468	2.857**	0.481	1.080*	0.412	1.103	0.431	0.755	0.483
Age	-0.008	0.008	-0.008	0.007	-0.006	0.005	-0.006	0.005	-0.004	0.005
Critical Care Areas[a]	0.161	0.111	0.152	0.112	0.121	0.100	0.084	0.058	0.090	0.059
Bachelor's Degree[b]	-0.015	0.170	-0.019	0.165	0.028	0.141	0.012	0.141	-0.013	0.149
Graduate Degree[b]	0.061	0.296	0.044	0.260	0.015	0.222	0.032	0.235	-0.026	0.244
Specialty Certification[c]	0.135	0.119	0.130	0.111	0.088	0.117	0.079	0.111	0.040	0.119
Autonomy			0.102	0.084	0.039	0.080	0.017	0.080	-0.011	0.082
Leader-Member Exchange			0.038	0.046	0.018	0.039	0.020	0.041	0.011	0.038
Support for Innovation			0.211	0.097	0.172	0.083	0.169	0.084	0.166	0.075
In-services and CE					0.004	0.002	0.004	0.002	0.004*	0.002
Attitude Towards Research					0.311	0.086	0.308*	0.086	0.312**	0.078
Belief Suspension					0.182	0.074	0.173	0.072	0.154	0.071
Medium Hospitals[d]							0.172	0.188	0.150	0.181
Large Hospitals[d]							0.191	0.140	0.157	0.136
Individual Innovative Behavior									0.168*	0.047
R^2	0.0484		0.1646		0.3844		0.3964		0.4183	
R^2 change			0.1161**		0.2198***		0.0120		0.0219*	

*p < .05, **p < .01, ***p < .001

RSE: Robust standard error, adjusted for 7 hospital clusters

Reference categories: [a]Non-critical care areas; [b]less than a Bachelor's degree; [c]no specialty certification; [d]small hospitals

Aim 3: Logistic regression. The third aim was to describe the relationships of individual innovative behavior, research utilization and the quality and safety of patient care. Logistic regression was used to answer this specific aim. A nested logistic regression model with cluster option was specified with patient safety as the binary outcome variable. The dependent variable quality of nursing care in unit was dichotomized and scores of 4 were coded as high and scores of 3 and lower were coded as low. The dependent variable patient safety was dichotomized. Grades of A were coded as high and grades of B and lower were coded as low. A total of 152 observations were used for these analyses.

Hypothesis 3*: Better individual innovative behavior and research utilization increases the likelihood of high quality of patient care.* The final model did not support this hypothesis (Table 11, Model 5). A nested logistic regression model with cluster option was specified with quality of nursing care in unit as the binary outcome variable and demographic variables, autonomy, leader-member exchange, support for innovation, in-services and continuing education, attitude towards research, belief suspension, hospital size, research utilization and individual innovative behavior as predictor variables.

Table 11

Logistic Regression Analyses for Variables Predicting Perceived High Quality of Nursing Care in Unit (N=152)

	Model 1			Model 2			Model 3			Model 4			Model 5		
Variables	B (RSE)	OR	95% CI for OR	B (RSE)	OR	95% CI for OR	B (RSE)	OR	95% CI for OR	B (RSE)	OR	95% CI for OR	B (RSE)	OR	95% CI for OR
Constant	-0.273 (0.556)	0.761	0.256 - 2.261	-5.424*** (1.394)	0.004	0.000- 0.068	-5.366** (1.692)	0.005	0.000 - 0.129	-5.180*** (1.201)	0.006	0.001 - 0.059	-5.687*** (1.458)	0.003	0.000 - 0.059
Age	0.012 (0.006)	1.012	0.999 - 1.024	0.016 (0.010)	1.016	0.996 - 1.037	0.016 (0.014)	1.016	0.989 - 1.044	0.016 (0.009)	1.016	0.998 - 1.034	0.016 (0.009)	1.016	0.998 - 1.035
Critical Care Areas[a]	0.575 (0.420)	1.778	0.780 - 4.053	0.845** (0.269)	2.328	1.375 - 3.941	0.817** (0.301)	2.264	1.256 - 4.081	0.702 (0.434)	2.018	0.862 - 4.722	0.700 (0.427)	2.013	0.871 - 4.652
Bachelor's Degree[b]	-0.585** (0.208)	0.557	0.371 - 0.838	-0.823 (0.433)	0.439	0.188 - 1.025	-0.814 (0.425)	0.443	0.193 - 1.019	-0.744 (0.382)	0.475	0.225 - 1.005	-0.755 (0.426)	0.470	0.204 - 1.083
Graduate Degree[b]	0.421 (0.500)	1.523	0.572 - 4.059	0.323 (0.631)	1.382	0.401 - 4.759	0.353 (0.698)	1.424	0.363 - 5.591	0.412 (0.602)	1.510	0.464 - 4.918	0.402 (0.624)	1.494	0.440 - 5.073
Specialty Certification[c]	0.286 (0.488)	1.331	0.511 - 3.465	0.063 (0.467)	1.065	0.426 - 2.660	0.070 (0.521)	1.072	0.386 - 2.978	0.281 (0.481)	1.324	0.515 - 3.400	0.266 (0.454)	1.305	0.536 - 3.177
Autonomy				0.368 (0.296)	1.446	0.808 - 2.584	0.387 (0.271)	1.472	0.866 - 2.502	0.463 (0.306)	1.589	0.873 - 2.893	0.429 (0.306)	1.535	0.843 - 2.795
Leader-Member Exchange				0.118 (0.114)	1.125	0.899 - 1.408	0.114 (0.125)	1.121	0.877 - 1.432	0.083 (0.099)	1.087	0.896 - 1.319	0.082 (0.084)	1.085	0.921 - 1.278
Support for Innovation				0.909** (0.276)	2.481	1.444 - 4.262	0.881*** (0.245)	2.412	1.492 - 3.900	0.876*** (0.217)	2.401	1.570 3.670	0.890* (0.268)	2.435	1.440 - 4.117
In-services and CE				0.0004 (0.020)	1.000	0.961 - 1.041	0.0002 (0.021)	1.000	0.960 - 1.042				-0.004 (0.019)	0.996	0.960 - 1.034
Attitude Towards Research				-0.048 (0.172)	0.953	0.680 - 1.335	-0.131 (0.237)	0.877	0.551 - 1.396				0.030 (0.184)	1.031	0.719 - 1.478
Belief Suspension				0.162 (0.178)	1.176	0.829 - 1.668	0.129 (0.224)	1.138	0.733 - 1.766				0.136 (0.181)	1.145	0.804 - 1.632
Medium Hospitals[d]				-0.528 (0.676)	0.590	0.157 - 2.219	-0.548 (0.752)	0.578	0.132 - 2.522						
Large Hospitals[d]				0.335 (0.468)	1.398	0.559 - 3.498	0.331 (0.456)	1.392	0.570 - 3.402						
Individual Innovative Beh.							-0.165 (0.344)	0.848	0.432 - 1.663						
Research Utilization							0.271 (0.512)	1.311	0.481 - 3.579						
Wald Chi2 Δ	31.78***			5.81			0.37			27.88***			1.21		

*p < .05, **p < .01, ***p < .001; RSE: Robust standard error, adjusted for 7 hospital clusters; OR: Odds Ratio, CI: Confidence Interval
Reference categories: [a]Non-critical care areas; [b]less than a Bachelor's degree; [c]no specialty certification; [d]small hospitals

Demographic variables were entered first to determine the effects of these variables on the perceptions of quality of nursing care in unit (Table 11, Model 1). This was followed by autonomy, leader-member exchange, and support for innovation (Table 11, Model 2). In-services and continuing education, attitude towards research, and belief suspension were then entered into the model (Table 11, Model 3), followed by hospital size (Table 11, Model 4). Individual innovative behavior and research utilization were entered last (Table 11, Model 5). Neither individual innovative behavior nor research utilization were statistically significant in the final model (Table 11, Model 5). Working in critical care areas and support for innovation were statistically significant in the final model (Table 11, Model 5). Registered nurses who worked in critical care areas were 2.264 times more likely to perceive high quality of nursing care in the unit compared to those nurses who worked in non-critical care areas controlling for the effects of other variables in the model. The odds of perceived high quality of care is multiplied by 2.412 for each additional one point of support for innovation, controlling for the effects of other variables in the model. This means that for each point increase in support for innovation, there is a 141% increase in the odds of perceived high quality of care in the unit. The final model correctly classified 72.37% of the cases.

Hypothesis 4*: Better individual innovative behavior and research utilization increases the likelihood of high safety of patient care.* This hypothesis was not supported. A nested logistic regression model with robust standard errors was specified with patient safety as the binary outcome variable and demographics, autonomy, leader-member exchange, support for innovation, in-services and continuing education, attitude towards research, belief suspension, individual innovative behavior and research utilization as the predictor variables. Demographic variables were entered first (Table 12, Model 1) followed by the continuous variables (Table 12, Models 2

and 3). This was followed by the dummy variables for hospital size (Table 12, Model 4). This allowed us to understand the effects of these variables first before individual innovative behavior and research utilization were entered into the final model (Table 12, Model 5). In the final model age, autonomy, and support for innovation were statistically significant but individual innovative behavior and research utilization were not (Table 12, Model 5). The odds of perceived high patient safety is multiplied by 1.030 for each additional year of age, controlling for the effects of other variables in the model. This means that for each year increase in age, there is a 3% increase in the odds of perceived high patient safety. The odds of perceived high patient safety is multiplied by 2.968 for each additional point increase in autonomy, controlling for the effects of other variables in the model. This means that for each additional one point increase in autonomy, there is a 197% increase in the odds of perceived high patient safety. The odds of perceived high patient safety is multiplied by 2.574 for each additional one point of support for innovation, controlling for the effects of other variables in the model. This means that for each additional point increase in support for innovation, there is a 157% increase in the odds of perceived high patient safety. The overall final model correctly classified 86.18% of the cases.

Table 12

Logistic Regression Analyses for Variables Predicting Perceived High Safety of Patient Care (N=152)

	Model 1			Model 2			Model 3			Model 4			Model 5		
Variables	B (RSE)	OR	95% CI for OR	B (RSE)	OR	95% CI for OR	B (RSE)	OR	95% CI for OR	B (RSE)	OR	95% CI for OR	B (RSE)	OR	95% CI for OR
Constant	-1.587* (0.647)	0.205	0.058 - 0.728	-8.421** (2.566)	0.000	0.000 - 0.034	8.038*** (2.155)	0.000	0.000 - 0.022	-8.453** (2.698)	0.000	0.000 - 0.042	-7.728* (3.183)	0.000	0.000 - 0.226
Age	0.023** (0.009)	1.024	1.006 - 1.041	0.034* (0.016)	1.034	1.002 - 1.068	0.035* (0.014)	1.036	1.008 - 1.065	0.034* (0.016)	1.034	1.003 - 1.067	0.029* (0.015)	1.030	1.001 - 1.060
Critical Care Areas[a]	0.564 (0.479)	1.758	0.687 - 4.498	0.837 (0.449)	2.310	0.958 - 5.572	0.723 (0.513)	2.062	0.754 - 5.632	0.738 (0.484)	2.091	0.810 - 5.400	0.838 (0.448)	2.311	0.960 - 5.565
Bachelor's Degree[b]	-0.428 (0.361)	0.651	0.321 - 1.321	-0.564 (0.623)	0.569	0.168 - 1.930	-0.604 (0.445)	0.547	0.228 - 1.309	-0.567 (0.579)	0.567	0.182 - 1.764	-0.534 (0.605)	0.586	0.179 - 1.918
Graduate Degree[b]	0.558 (0.533)	1.747	0.614 - 4.966	0.616 (0.710)	1.852	0.461 - 7.447	0.694 (0.581)	2.001	0.640 - 6.252	0.654 (0.656)	1.924	0.531 - 6.964	0.736 (0.699)	2.088	0.531 - 8.211
Specialty Certification[c]	-0.342 (0.321)	0.710	0.379 - 1.332	-0.566 (0.438)	0.568	0.241 - 1.340	0.463 (0.452)	0.629	0.260 - 1.525	-0.525 (0.462)	0.592	0.239 - 1.465	-0.486 (0.428)	0.615	0.266 - 1.423
Autonomy				1.016* (0.400)	2.761	1.260 - 6.049	1.106* (0.465)	3.021	1.214 - 7.517	0.991* (0.455)	2.695	1.104 - 6.577	1.088** (0.402)	2.968	1.351 - 6.520
Leader-Member Exchange				-0.079 (0.123)	0.924	0.727 - 1.175	-0.076 (0.122)	0.927	0.730 - 1.177	-0.080 (0.117)	0.923	0.733 - 1.161	-0.060 (0.128)	0.942	0.733 - 1.210
Support for Innovation				0.904*** (0.151)	2.469	1.836 - 3.319	0.843** (0.259)	2.323	1.399 - 3.857	0.885*** (0.176)	2.422	1.715 - 3.421	0.945*** (0.196)	2.574	1.751 - 3.783
In-services and CE				-0.001 (0.020)	0.999	0.960 - 1.040				-0.002 (0.020)	0.998	0.960 - 1.037	-0.001 (0.020)	0.999	0.960 - 1.039
Attitude Towards Research				-0.190 (0.356)	0.827	0.412 - 1.661				-0.175 (0.352)	0.839	0.421 - 1.675	-0.130 (0.426)	0.878	0.381 - 2.023
Belief Suspension				0.426* (0.217)	1.531	1.001 - 2.340				0.407 (0.222)	1.502	0.971 - 2.322	0.498 (0.264)	1.646	0.982 - 2.759
Medium Hospitals[d]				-0.393 (0.623)	0.675	0.199 - 2.290							-0.329 (0.646)	0.719	0.203 - 2.551
Large Hospitals[d]				-0.215 (0.504)	0.806	0.300 - 2.165							-0.139 (0.518)	0.870	0.315 - 2.402
Individual Innovative Beh.													-0.328 (0.369)	0.720	0.350 - 1.484
Research Utilization													-0.153 (0.457)	0.858	0.351 - 2.100
Wald Chi2 Δ	29.31***			0.40			16.82***			12.44**			1.23		

*p < .05, **p < .01, ***p < .001; RSE: Robust standard error, adjusted for 7 hospital clusters; OR: Odds Ratio, CI: Confidence Interval

Reference categories: [a]Non-critical care areas; [b]less than a Bachelor's degree; [c]no specialty certification; [d]small hospitals

Individual innovative behavior and research utilization as mediating variables.

Research utilization and individual innovative behavior were theorized to mediate the relationships between the antecedent variables (autonomy, leader-member exchange and support for innovation) and the outcome variables (quality of nursing care in unit and safety of patient care); the possibility of mediation was tested explicitly. Mediation is a hypothesized causal relationship in which there is an intervening or mediator variable that mediates the relationship between the predictor and outcome variables (Baron & Kenny, 1986). Baron and Kenny's (1986) four step approach was utilized to determine the mediation relationship except for Step 3. Step 3 used the recommendation from James and Brett (1984) to understand the contribution of the mediator variables to the outcome variables without the antecedent variables. Step 1 involved estimating logistic regression equations in which the antecedent variables predicted the outcome variables. Step 2 was a simple linear regression analyses in which the antecedent variables predicted the mediator variables of individual innovative behavior and research utilization. Step 3 was a logistic regression analyses in which the mediator variables predicted the outcome variables. Step 4 was a logistic regression analyses that included both the antecedent and mediating variables as predictors of the outcome variables.

The purpose of the first three steps was to determine if a mediating relationship exists between these antecedent variables and the outcome variables. Step 4 was added to verify the mediating relationship. Specifically, mediation might be present if the coefficient for the mediating variable changes when the antecedent variables were added to the regression equation. If one of the first three steps did not find significant relationships between the variables, or there was not a large change in the coefficient of the mediating variables between steps 3 and 4, then mediation was not likely.

The analyses did not reveal many statistically significant relationships, but the results suggest that mediation is possible. As seen in Table 13, the antecedent variable of organizational support for innovation was a significant predictor of high quality of nursing care in unit (Step 1). The antecedent variables of autonomy and belief suspension were significant predictors of individual innovative behavior (Step 2). Individual innovative behavior had a positive relationship with high quality of nursing care, although this relationship was not statistically significant (Step 3). When both the antecedent and mediator variables were included in the equation (Step 4), neither autonomy nor individual innovative behavior was a statistically significant predictor. However, the relationship between individual innovative behavior and the quality of nursing care in unit became negative, which is a notable change from the equation when the antecedent variables were not included. The Wald Chi square change for the models was significant from Step 3 to Step 4 ($P < .001$). This suggests that individual innovative behavior may be a mediator of the relationship between autonomy and quality of nursing care.

Table 14 presents the same analysis to test whether research utilization is a mediating variable for quality of care. The antecedent variable of organizational support for innovation was a significant predictor of quality of nursing care in unit (Step 1). Attitude towards research was a significant predictor of research utilization (Step 2). Research utilization had a positive relationship with quality of nursing care in unit and was statistically significant (Step 3). When both the antecedent variables and mediator variables were entered in the equation (Step 4), support for innovation was statistically significant but research utilization was not statistically significant. However, the relationship between research utilization and the quality of nursing care in unit decreased and the relationship was not significant anymore, which is a notable change from when the antecedent variables were not included. This suggests that research utilization

may be a mediator of the relationship between support for innovation and the quality of nursing care.

Table 13

Four Step Approach to Determine Individual Innovative Behavior as Mediating Variable with Perceived Quality of Nursing Care in Unit as Outcome Variable (N=152)

	Step 1	Step 2	Step 3	Step 4
Independent Variable(s)	Antecedent variables	Antecedent variables	Individual innovative behavior	Antecedent variables and individual innovative behavior
Dependent Variable	Perceived quality of nursing care in unit (high = 1)	Individual innovative behavior	Perceived quality of nursing care in unit (high = 1)	Perceived quality of nursing care in unit (high = 1)
	Unstandardized Beta	Unstandardized Beta	Unstandardized Beta	Unstandardized Beta
Constant	-5.424***	2.076	-1.196	-5.194**
Age	0.016	-0.010	0.015	0.015
Critical Care[a]	0.845**	-0.039	0.641*	0.846**
Bachelor's Degree[b]	-0.823*	0.147	-0.738**	-0.815
Graduate Degree[b]	0.323	0.345	0.280	0.345
Specialty Certification[c]	0.063	0.231*	0.029	0.088
Medium Hospital[d]	-0.528	0.130	-0.087	-0.512
Large Hospital[d]	0.335	0.202	0.659	0.360
Autonomy	0.368	0.162*	-	0.384
Leader-Member Exchange	0.118	0.056	-	0.122
Support for Innovation	0.908**	0.023	-	0.916**
In-services and Continuing Education	0.000	0.001	-	0.001
Attitude Towards Research	-0.048	-0.025	-	-0.048
Belief Suspension	0.162	0.112**	-	0.172
Individual Innovative Behavior	-	-	0.237	-0.108

* p<.05, **p<.01, ***p<.001

Reference categories: [a]Non-critical care areas; [b]less than a Bachelor's degree; [c]no specialty certification; [d]small hospitals

Table 14

Four Step Approach to Determine Research Utilization as Mediating Variable with Perceived Quality of Nursing Care in Unit as Outcome Variable (N=152)

	Step 1	Step 2	Step 3	Step 4
Independent Variable(s)	Antecedent variables	Antecedent variables	Research utilization	Antecedent variables and research utilization
Dependent variable	Perceived quality of nursing care in unit (high = 1)	Research utilization	Perceived quality of nursing care in unit (high = 1)	Perceived quality of nursing care in unit (high = 1)
	Unstandardized Beta	Unstandardized Beta	Unstandardized Beta	Unstandardized Beta
Constant	-5.424***	1.103*	-2.797***	-5.673***
Age	0.016	-0.006	0.018	0.018
Critical Care[a]	0.845**	0.084	0.586	0.820**
Bachelor's Degree[b]	-0.823*	0.012	-0.701*	-0.826
Graduate Degree[b]	0.323	0.032	0.347	0.319
Specialty Certification[c]	0.063	0.079	0.006	0.036
Medium Hospital[d]	-0.528	0.172	-0.226	-0.565
Large Hospital[d]	0.335	0.191	0.532	0.301
Autonomy	0.368	0.017	-	0.363
Leader-Member Exchange	0.118	0.020	-	0.110
Support for Innovation	0.909**	0.169	-	0.875**
In-services and Continuing Education	0.000	0.004	-	-0.000
Attitude Towards Research	-0.048	0.308*	-	-0.121
Belief Suspension	0.162	0.173	-	0.121
Research Utilization	-	-	0.604*	0.232

* p<.05, **p<.01, ***p<.001
Reference categories: [a]Non-critical care areas; [b]less than a Bachelor's degree; [c]no specialty certification; [d]small hospitals

Table 15 presents the analysis to test whether individual innovative behavior is a mediating variable for safety of patient care. The antecedent variables of autonomy and support for innovation were significant predictors of safety of patient care (Step 1). Belief suspension was also a significant predictor of safety of patient care (Step 1). Autonomy and belief

suspension were significant predictors of individual innovative behavior (Step 2). Individual innovative behavior had a positive relationship with safety of patient care, although this relationship is not statistically significant (Step 3). When the predictor variables and mediator variables were included in the equation, (Step 4) neither belief suspension nor individual innovative behavior was statistically significant. However, the relationship between individual innovative behavior and safety of patient care became negative, which was a notable change from the equation when the antecedent variables were not included. The Wald Chi square change for the models was significant from Step 3 to Step 4 ($P < .001$). This suggests that individual innovative behavior may be a mediator of the relationship between autonomy and the safety of patient care as well as support for innovation and the safety of patient care.

Table 16 presents the analysis to test whether research utilization was a mediating variable for the safety of patient care. The antecedent variables autonomy and support for innovation were significant predictors of safety of patient care (Step 1). Belief suspension was also a significant predictor of safety of patient care (Step 1). Attitude towards research was a significant predictor of research utilization (Step 2). Research utilization had a positive relationship with safety of patient care, although this relationship was not statistically significant (Step 3). When the antecedent variables and mediator variables were included in the equation (Step 4) the relationship between research utilization and safety of patient care became negative, which is a notable change from the equation when the antecedent variables were not included. This suggests that research utilization may be a mediator of the relationships between autonomy and the safety of patient care as well as support for innovation and safety of patient care.

Table 15

Four Step Approach to Determine Individual Innovative Behavior as Mediating Variable with Perceived Safety of Patient Care as Outcome Variable (N=152)

	Step 1	Step 2	Step 3	Step 4
Independent Variable(s)	Antecedent variables	Antecedent variables	Individual innovative behavior	Antecedent variables and individual innovative behavior
Dependent Variable	Perceived safety of patient care (high = 1)	Individual innovative behavior	Perceived safety of patient care (high = 1)	Perceived safety of patient care (high = 1)
	Unstandardized beta	Unstandardized beta	Unstandardized beta	Unstandardized beta
Constant	-8.421**	2.076**	-2.334	-7.806*
Age	0.034*	-0.010	0.025**	0.031
Critical Care[a]	0.837	-0.039	0.526	0.829
Bachelor's Degree[b]	-0.564	0.147	-0.511	-0.529
Graduate Degree[b]	0.616	0.345	0.508	0.739
Specialty Certification[c]	-0.566	0.231*	-0.472	-0.494
Medium Hospital[d]	-0.393	0.130	0.252	-0.355
Large Hospital[d]	-0.215	0.202	0.553	-0.162
Autonomy	1.016*	0.162*	-	1.084**
Leader-Member Exchange	-0.079	0.056	-	-0.065
Support for Innovation	0.904***	0.023	-	0.922***
In-services and Continuing Education	-0.001	0.001	-	-0.001
Attitude Towards Research	-0.190	-0.025	-	-0.191
Belief Suspension	0.426*	0.112**	-	0.479
Individual Innovative Behavior	-	-	0.150	-0.353

* p<.05, **p<.01, ***p<.001

Reference categories: [a]Non-critical care areas; [b]less than a Bachelor's degree; [c]no specialty certification; [d]small hospitals

Table 16

Four Step Approach to Determine Research Utilization as Mediating Variable with Perceived Safety of Patient Care as Outcome Variable (N=152)

	Step 1	Step 2	Step 3	Step 4
Independent Variable(s)	Antecedent variables	Antecedent variables	Research utilization	Antecedent variables and research utilization
Dependent Variable	Perceived safety of Patient Care (high = 1)	Research utilization	Perceived safety of patient care (high = 1)	Perceived safety of patient care (high = 1)
	Unstandardized Beta	Unstandardized Beta	Unstandardized Beta	Unstandardized Beta
Constant	-8.421**	1.103*	-3.595*	-8.240**
Age	0.034*	-0.006	0.029**	0.032*
Critical Care[a]	0.837	0.084	0.476	0.851
Bachelor's Degree[b]	-0.564	0.012	-0.475	-0.570
Graduate Degree[b]	0.616	0.032	0.516	0.625
Specialty Certification[c]	-0.566	0.079	-0.479	-0.550
Medium Hospital[d]	-0.393	0.172	0.134	-0.352
Large Hospital[d]	-0.215	0.191	0.420	-0.176
Autonomy	1.016*	0.017	-	1.027**
Leader-Member Exchange	-0.079	0.020	-	-0.070
Support for Innovation	0.904***	0.169	-	0.938***
In-services and Continuing Education	-0.001	0.004	-	-0.001
Attitude Towards Research	-0.190	0.308*	-	-0.101
Belief Suspension	0.426*	0.173	-	0.458*
Research Utilization	-	-	0.438	-0.222

* p<.05, **p<.01, ***p<.001

Reference categories: [a]Non-critical care areas; [b]less than a Bachelor's degree; [c]no specialty certification; [d]small hospitals

Summary

Registered nurses on average reported moderate levels of individual innovative behavior, research utilization, autonomy, leader-member exchange, and support for innovation. They reported that quality of nursing care in unit and last shift were both good and rated patient safety as a 'B'.

Most of the hypotheses for this study were either partially or fully supported. There were differences found among the registered nurses in the major variables when they were grouped according to the categorical variables. Employee status, level of education, clinical area, hospital innovativeness, and hospital size were the categorical variables that showed differences in some of the major variables. Categorizing registered nurses according to gender did not show any significant differences. Certification, employee status, and education showed significant differences only in one major variable: individual innovative behavior for certification and education; leader-member exchange for employee status. Hospital innovativeness showed differences in 3 major variables. Clinical area showed significant differences in 2 major variables.

Age was the only variable that showed a statistically significant negative correlation with some of the study variables. Individual innovative behavior and research utilization had positively weak to moderate association with most of the other major variables.

Multivariate regression analysis of individual innovative behavior revealed that autonomy, specialty certification and belief suspension were significant predictors of individual innovative behavior but leader-member exchange and support for innovation were not. Multivariate regression analysis that analyzed predictors for research utilization revealed that in-services and continuing education, attitude towards research, and individual innovative behavior

were significant predictors of research utilization but autonomy and leader-member exchange were not.

Logistic regression analysis that analyzed predictors for perceived high quality of nursing care in unit revealed that support for innovation and working in critical care areas were significant predictors of perceived high quality of nursing care in unit but individual innovative behavior and research utilization were not. Logistic regression analysis of safety of patient care revealed that age, autonomy, and support for innovation were significant predictors of perceived high safety of patient care but individual innovative behavior and research utilization were not.

Individual innovative behavior and research utilization may mediate the relationships between the antecedent variables and the quality and safety of patient care. Overall, these analyses provided some revealing findings about individual innovative behavior, research utilization, autonomy, leader-member exchange, and the perceived quality and safety of patient care. Chapter 5 provides a discussion of these findings as well as implications and conclusions.

CHAPTER 5

DISCUSSION

The goal of this study was to explore individual innovative behavior among registered nurses working in acute care hospitals. This chapter provides a discussion of the results of the study divided into four sections. First, a summary of the significant results is discussed. Second, the implications of findings are examined in relation to the theoretical model. This is followed by a discussion of the limitations of the study and suggestions for future research are presented.

Findings

A summary figure based on the results of this study is presented in Figure 8. Autonomy, belief suspension, and specialty certification significantly predicted individual innovative behavior. Attitude towards research, in-services and continuing education, and individual innovative behavior significantly predicted research utilization. Support for innovation and working in critical care areas predicted perceived high quality of patient care. Age, autonomy, and support for innovation predicted perceived high safety of patient care. Of the three antecedent variables, only autonomy had a significant relationship with individual innovative behavior and none of the antecedent variables had a significant relationship with research utilization. The relationships of individual innovative behavior and research utilization to the quality and safety of patient care was not supported by this study as initially proposed in the model.

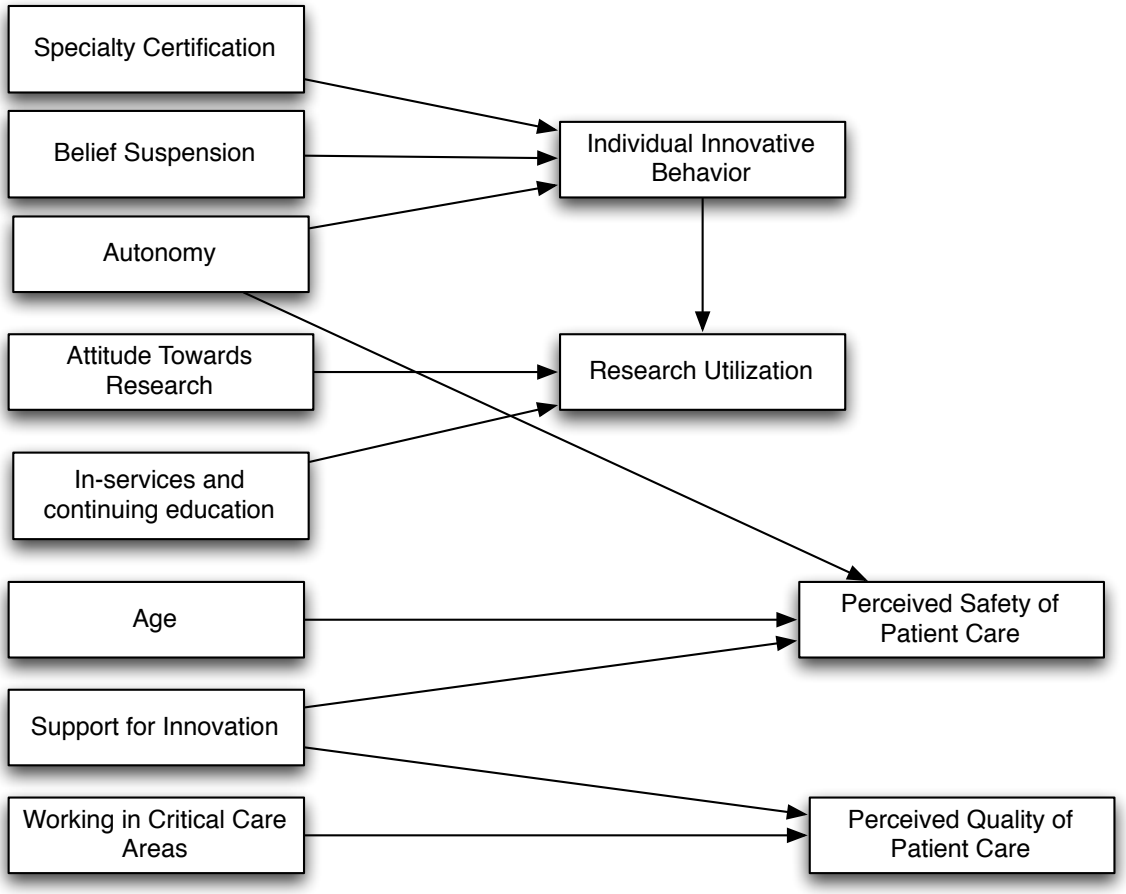

Figure 8. Summary of antecedent variables, individual innovative behavior, research utilization, and the perceived quality and safety of patient care.

Implications

The following section discusses the implications of the findings. The results of this study are contrasted and compared to previous studies on individual innovative behavior, research utilization, and the perceived quality and safety of patient care.

Individual innovative behavior. This study revealed that registered nurses from acute care hospitals possessed moderate levels of individual innovative behavior (mean=3.13). Although these registered nurses work in highly structured environments, they perceived that they had moderate individual innovative behavior. There were some nurses who reported low scores in individual innovative behavior but a majority of registered nurses reported scores of 3

or higher. The results in the literature showed that the mean for individual innovative behavior was between 2.59 to 3.9 (scale of 1 to 5) using various instruments to measure individual innovative behavior from various industries (De Jong & Den Hartog, 2010; Jafri, 2010; Pundt, Martins, & Nerdinger, 2010; Sanders et al., 2010; S. G. Scott & Bruce, 1994b; Yuan & Woodman, 2010). Previous studies revealed that engineers, scientists, technicians, and financial services employees had low individual innovative behavior scores while pharmacists and high-technology firm employees had higher levels of individual innovative behavior. Nursing studies on individual innovative behavior did not report the mean for individual innovative behavior except for the study of hospital nurses by Weng, Huang, & Lin (2013) where the reported mean was 3.35 (scale of 1 to 5). The mean for individual innovative behavior for this study is lower than that reported by Weng et al. (2013) but is within the low end of the range of results for studies on individual innovative behavior in other occupations. The sample for the study from Weng et al. (2013) is from China and the perception of individual innovative behavior may not be similar to the perception of nurses from the United States.

The results for individual innovative behavior suggest that increased cultivation of the behavior is needed among registered nurses. The IOM (2010a) report 'Future of Nursing' highlights the role of innovation in nursing. Organizations need to provide registered nurses with the support, resources, and an environment that promotes individual innovative behavior and research utilization. This study found that there are very tangible ways to increase individual innovative behavior and research utilization. One way to achieve this result is by providing registered nurses with more autonomy. This study's finding on autonomy is similar to a qualitative finding by Lacey (Lacey, 1994) that nurses who were granted more autonomy were more confident in their ability to promote research utilization. Because nurses in their clinical

practice are usually given enough freedom to work independently without excessive management oversight, there is opportunity for more independent and innovative thinking (Gagnon, Bakker, Montgomery, & Palkovits, 2010; J. S. Smith et al., 2011). Providing nurses with leadership that is open-minded and supports shared decision-making and teamwork (Gagnon et al., 2010; Mrayyan, 2004; Rafferty et al., 2001) creates an environment that empowers nurses to be more autonomous and innovative in their behavior. Another factor that can contribute to increased autonomy is experience. Autonomy is an attribute that is developed and improved over time through professional knowledge and supportive and trusting relationships; therefore, retaining and rewarding experienced employees could have an impact on autonomous practices in the organization (Gagnon et al., 2010; Mrayyan, 2005). Decreased burnout, increased job satisfaction and enhanced teamwork may also be achieved (Mrayyan, 2004; Rafferty et al., 2001; J. S. Smith et al., 2011), in addition to improved job productivity and organizational outcomes (Chang & Liu, 2008; Salge & Vera, 2009; Yuan & Woodman, 2010) because nurses are empowered to apply new findings into their nursing practice through research utilization and increasing levels of individual innovative behavior.

This study provides the support for the significant relationship of belief suspension to individual innovative behavior. While previous research found belief suspension as a significant predictor of research utilization (Estabrooks, Kenny, et al., 2007; Kenny, 2005), this study did not find that relationship, and instead found that belief suspension had a significant positive relationship with individual innovative behavior. Registered nurses who were able to have the openness to accept new evidence despite what they have previously learned had higher levels of individual innovative behavior. Belief suspension could serve as a tool for organizations to screen employees who have a higher propensity to have individual innovative behavior.

Other statistically significant differences in individual innovative behavior mean scores among registered nurses were noticeable when categorizing them according to specialty certification, education, and hospital innovativeness. However, further analysis revealed that specialty certification was the only categorical variable that had a significant relationship with individual innovative behavior. Those who had reported specialty certification had higher levels of individual innovative behavior compared to those who were not certified. This suggests that registered nurses with specialty certifications are either different from those without specialty certifications or are encouraged to be more autonomous than those without. For example, those who have specialty certifications were previously found to be more empowered in the workplace (Piazza, Donahue, Dykes, Griffin, & Fitzpatrick, 2006), or they might inherently possess the motivation and drive to think innovatively. Additionally, specialty certification has previously been found to impact enhance collaboration among registered nurses as well as increased patient satisfaction (Bekemeier, 2007; Niebuhr & Biel, 2007). For these reasons, specialty certification among registered nurses should be encouraged and supported. Support for specialty certification could include providing certification review classes, financial support for getting the specialty certification, rewards for passing the examination, as well as on-going support for the maintenance of the certification.

Although hospital-level innovativeness was not included in the regression analysis because of missing data, preliminary analysis of this variance revealed that registered nurses who worked for hospitals with moderate innovativeness reported higher scores in individual innovative behavior compared to both high- and low-innovative hospitals. An unexpected finding, though, was registered nurses from moderate innovativeness hospitals reported higher scores in individual innovative behavior compared to high innovativeness hospitals. It was

expected that registered nurses from high innovativeness hospitals would also have high individual innovative behavior scores. Other hospital attributes not included in this study may explain this increase in individual innovative behavior among registered nurses from moderate innovativeness hospitals. One reason could be that medium innovativeness hospitals are still striving to increase their EMR adoption and thus have higher intensity of resource input compared to high innovativeness hospitals that have already achieved a high level of EMR adoption (Pundt et al., 2010; Subramaniam, 2007).

Research utilization. Registered nurses remain moderately committed to research utilization (mean = 3.88) and this is similar to results found in other studies that were 3.57 to 3.79 on a scale of 1 to 5 (Champion & Leach, 1989; Lacey, 1994; McCleary & Brown, 2003). There appears to be little progression in research utilization among registered nurses across the years as the score remains at a moderate level. Two variables that had previously been identified to have a consistent positive relationship with research utilization were attitude towards research and in-service education (Estabrooks, 1999b; Estabrooks, Kenny, et al., 2007; Lacey, 1994; Squires et al., 2011). This study provides the support for those relationships as well by finding that registered nurses who had a positive attitude towards research or who had a higher level of participation in-services and continuing education also had higher levels of research utilization. Creating a culture that promotes research and providing in-services and continuing education could be a significant intervention opportunity for organizations. Increasing education about the benefits of research utilization as well as identifying and recognizing registered nurses in the organization with a positive attitude towards research can also shift the culture towards to one that embraces research utilization (Lacey, 1994). In-services and continuing education programs can be implemented by hospitals through existing education departments in the organization or

by providing financial resources to assist registered nurses to attend external continuing education events to help increase research utilization among registered nurses.

A key finding of this study is the significant positive relationship between individual innovative behavior and research utilization. Although individual innovative behavior was theorized to have a relationship with research utilization (Rogers, 2003), it had not been previously tested. This study provides empirical evidence that a significant positive relationship exists. Individual innovative behavior could lead to increasing the adoption of research evidence into nursing practice. Developing policies that target individual innovative behavior can help registered nurses develop capabilities to implement research findings into practice. Even though this study does not provide support for the relationship between research utilization and the quality and safety of patient care, other studies have shown this relationship (Aiken et al., 2002).

In this study, support for innovation was found to have a significant relationship with individual innovative behavior and with research utilization in the bivariate correlations; however, after a more thorough multivariate analysis, there were no significant relationships to either individual innovative behavior or research utilization. Previous studies found that support for innovation had significant relationships with individual innovative behavior (De Jong & Den Hartog, 2003; Krause, 2004). This difference in findings could have been a result of the different sample populations. This study involved registered nurses; whereas, previous studies were from the business industry. Furthermore, individual and organizational barriers can hinder in creating a hospital environment that supports innovation. Even if management supports innovation, other factors, such as lack of knowledge about research, insufficient time, lack of availability of research reports, or lack of authority to change clinical practice, might actually hamper

individual innovative behavior (Saint et al., 2009; Schoonover, 2009; Strickland & O'Leary-Kelley, 2009).

Perceived quality and safety of patient care. Demographic variables, including working in critical areas and age, were found to be significant predictors to perceived quality and safety of patient care respectively. Older nurses appear to have better perception of patient safety. This finding implies that younger nurses may need more training and education in order to support efforts in improving patient safety. Registered nurses who worked in critical care areas had a higher likelihood of perceived high quality of patient care. Hospitals could expend greater efforts to develop the capabilities of non-critical care area nurses.

Autonomy was found to have a significant relationship with perceived high safety of patient care. This supports the findings from a previous study (Rafferty et al., 2001). Registered nurses who have more autonomy over their nursing practice may believe they have more control over their daily practice. Thus, if they find anything that is unsafe for patients they are able to make the necessary changes to correct unsafe practices.

Our findings also indicate that support for innovation increases the likelihood of perceived high quality and safety of patient care. Support for innovation might provide the organizational environment where nurses are able to pursue high quality and safety of patient care. Previous studies have found that organizational support increases job satisfaction as well as the quality of care (Aiken et al., 2002; Kwak et al., 2010).

Individual innovative behavior and research utilization did not have a significant relationship with either perceived quality or perceived safety of patient care. It was theorized that individual innovative behavior and research utilization would have a positive effect on the perception of quality and safety of patient care. However, in this study there was no relationship

between these variables. This study might not have identified the underlying mechanisms by which individual innovative behavior and research utilization might influence the quality and safety of patient care.

Limitations of the Study

Several limitations to this study were identified. First, the response rate for this study was unknown and the estimated response rate was low; Only 252 registered nurses responded and of those, only 229 responses were used for this study. It is not known how the perceptions of the other registered nurses who did not respond might impact the study findings. The second limitation was related to the selection of the sample. The hospitals that participated were self-selected. This sample of hospitals may not be representative of acute care hospitals in California or the United States. There was also the self-selection of registered nurses who responded to the survey. This study only sampled registered nurses who worked for acute care hospitals and may not be representative of registered nurses who work in other fields like public health or long-term care. This study was done in the State of California and may not represent the views of registered nurses who work in other states. Third, the categorization of hospital-level innovativeness is limited. The data from the HIMSS database on EMR adoption was based on 2009 information and this study was done in 2012; further, EMR adoption data were not available for all the study hospitals. Hospitals who participated in this study may have already achieved better EMR adoption by 2012.

Future Research

Future research should focus on how to foster individual innovative behavior as well as research utilization among registered nurses. The business literature has examined various individual, team, leader, and organizational attributes that contribute to individual innovative

behavior. This research tested some of those attributes but other attributes might provide a better explanation for individual innovative behavior and research utilization. Individual level attributes of psychological empowerment, external contact, intrinsic interest, commitment, image risks, production ownership, problem-solving styles, self-leadership skills, and fairness perceptions have previously been found to have significant relationships with individual innovative behavior (Basu & Green, 1997; Carmeli et al., 2006; De Jong & Kemp, 2003; Jafri, 2010; Janssen, 2001; Knol & Van Linge, 2009; S. G. Scott & Bruce, 1994b, 1998; Subramaniam, 2007; Yuan & Woodman, 2010; Zhou et al., 2009). Leader attributes of expert knowledge and information, granting of degrees of freedom, openness in decision-making, innovative reputation, transformational leadership, as well as support, encouragement, and expectations were previously found to have relationships with individual innovative behavior (Åmo, 2006; Basu & Green, 1997; De Jong & Den Hartog, 2003; Janssen, 2005; Krause, 2004; Subramaniam, 2007; Yuan & Woodman, 2010). Group attributes that were previously identified to have a relationship with individual innovative behavior include task and goal interdependence as well as group diversity (Van der Vegt & Janssen, 2003). Organizational level attributes include innovativeness as a job requirement, strategic attention, high commitment human and resource management (De Jong & Den Hartog, 2003; Dorenbosch et al., 2005; Yuan & Woodman, 2010; Zhou et al., 2009). Some of these attributes also have relationships with research utilization but most others have not been previously tested.

Another research area that would be interesting to explore is whether individual innovative behavior actually translates to innovative output in nursing. The actual development and application of new ideas in healthcare is beneficial to better organizational performance (Douglas & Ryman, 2003; Tiwari & Heese, 2009). Previous research has shown that individual

innovative behavior has positive relationships with innovative output and job productivity (Chang & Liu, 2008; De Jong & Den Hartog, 2008). It would be helpful to understand whether individual innovative behavior translates to actual generation, promotion, and implementation of specific evidence-based practice innovations in nursing.

As noted above, EMR adoption may not measure hospital innovativeness well. Future research should explore the role of other instruments that might gauge hospital innovativeness. Hospital innovativeness as measured through EMR percent adoption in the data set used for this study might not be the best tool as the data were delayed by a few years. Other tools that gauge hospital innovativeness in a timelier manner might provide a better understanding of organizational propensity to innovate.

Future research should also consider the role that other variables play in the relationships between (1) individual innovative behavior and the perceived quality and safety of patient care; and (2) research utilization and the perceived quality and safety of patient care. Other researchers have found links between certain behaviors and the quality and safety of patient care. The quality and safety of patient care are important outcomes for hospitals. Understanding factors that contribute to the quality and safety of patient care could help hospitals improve the care provided to patients.

Finally, there is a need for research to explore the types of interventions that would help improve individual innovative behavior. Understanding if there are training tools and what actually helps develop individual innovative behavior can be beneficial to the field. If individual innovative behavior can be increased through nurse training and education this would have an impact on the use of research in organizations.

Conclusions

This research study sought to describe individual innovative behavior as well as understand the relationships that individual innovative behavior had to antecedent variables (autonomy, leader-member exchange and support for innovation) as well as research utilization and the quality and safety of patient care. This study confirms the non-empirical assumption that nurses have individual innovative behavior. However, individual innovative behavior among registered nurses still needs improvement. Multiple healthcare stakeholders continue to emphasize the importance of innovations in improving patient outcomes. These stakeholders should provide the environment needed to foster individual innovative behavior and research utilization among registered nurses. This study provided full or partial support to some of the hypotheses advanced that identified relationships between the major variables. The findings for this study provides some guidance on how to improve individual innovative behavior and hospitals should take note of these variables that have significant relationships to individual innovative behavior. Research utilization also was present among the registered nurses but remains at moderate levels suggesting the need to increase this attribute among registered nurses. This study provides evidence on how important it is for organizations to cultivate individual innovative behavior as this has a significant relationship with research utilization – this is the first study to determine this relationship. Key contributing factors to individual innovative behavior were 1) specialty certification, 2) belief suspension, and 3) autonomy. Key contributing factors to research utilization were 1) individual innovative behavior, 2) attitude towards research, 3) in-services and continuing education. Healthcare stakeholders should focus their efforts in providing these support mechanisms to help registered nurses develop capabilities to support innovations in nursing practice. Nurses should also be active participants in finding ways

to improve patient outcomes. They provide the closest care to patients at the bedside and should embrace research utilization for the role that it plays in patient outcomes. Registered nurses should engage in identifying problems and accessing, assessing, applying, persuading, implementing, and integrating research findings into their nursing practice to help resolve these problems. This study does not provide support for the relationships between individual innovative behavior or research utilization to the perceived quality and safety of patient care. The findings of this study though should not negate the need to develop individual innovative behavior or research utilization as both of these variables have previously been shown in other studies to have a positive impact on patient outcomes.

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APPENDIX A

Attachment 1: Letter to the Chief Nurse Executives

Dear Chief Nurse Executive,

A report on the future of nursing that came out in 2010 from the Institute of Medicine highlights the role of nurses in the improvement of the health of the nation and calls for nurses to be innovative in their practice, research, and education. However, there is scant evidence in the literature that nurses are innovative and the bureaucratic environment nurses work in might actually dampen this behavior.

We are conducting a study to determine the registered nurse's individual innovative behavior, research utilization, perceived quality and safety of patient care, and several other variables. Jose J. Dy Bunpin III, RN, PhD(c) and Susan Chapman, RN, PhD from the Department of Social and Behavioral Sciences at the University of California San Francisco are conducting this study. We would like to recruit your organization to take part in this study. If you are interested in taking part in this study please contact Jose Dy Bunpin III at 415-596-8804 or Jose.Dybunpin@UCSF.edu. He would be happy to discuss the mechanics necessary to pursue this study within your organization.

If you agree for your organization to take part in this study we will request your registered nurses to complete a printed survey or answer online through a survey portal after the necessary Committee on Human Research or Institutional Review Board approval from your organization. The survey asks about individual innovative behavior, research utilization, autonomy, leader-member exchange, support for innovation, the quality and safety of patient care, and some demographic characteristics. It will take about *8-15 minutes* to complete the survey. Attached along with this letter is the questionnaire that will be used for this study. The registered nurse response to the questionnaire is their implied consent. The nurses will be requested to return the questionnaire directly to the researchers via a postage paid envelope.

We will do our best to protect the information we collect from the registered nurses. Information that identifies registered nurses will be kept secure. The survey itself will not include details that directly identify them, such as their name or address. The completed surveys will be kept secure and separate from information that identifies the nurses. Only a small number of researchers will have direct access to completed surveys. If this study is published or presented at scientific meetings, names and other information that might identify the nurses will not be used.

The nurses' answers to the questions posed in this questionnaire will provide us with insight as to how registered nurses perceive their own innovative behavior, and also how they perceive research utilization and the quality and safety of patient care in your organization. This will assist us in understanding the different variables that have relationships to research utilization in practice. We would be happy to share the findings of this study with your organization once the data has been collected and analyzed.

We look forward to hearing back from you.

Sincerely,

JOSE J. DY BUNPIN III, RN, MBA, PhD(c)
Doctoral Candidate
Department of Social and Behavioral Sciences
University of California-San Francisco

SUSAN CHAPMAN, RN, PhD
Faculty Adviser
Department of Social and Behavioral Sciences
University of California-San Francisco

APPENDIX B

Attachment 2: Letter to Registered Nurses and Questionnaire

Dear Nurse Colleague,

A report on the future of nursing that came out in 2010 from the Institute of Medicine highlights the role of nurses in the improvement of the health of the nation and calls for nurses to be innovative in their practice, research, and education. However, there is scant evidence in the literature that nurses are innovative and the bureaucratic environment nurses work in might actually dampen this behavior.

We are conducting a study to determine the registered nurse's individual innovative behavior, research utilization, perceived quality and safety of patient care, and several other variables. Jose J. Dy Bunpin III, RN, PhD(c) and Susan Chapman, RN, PhD from the Department of Social and Behavioral Sciences at the University of California San Francisco are conducting this study.

You are being asked to take part in this study because you are a Registered Nurse with an active license to practice. Your organization is participating in this study and has consented to have this questionnaire delivered to you.

If you agree to be in this study, you may complete this printed survey or answer online through a survey portal. The survey asks about individual innovative behavior, research utilization, autonomy, leader-member exchange, support for innovation, the quality and safety of patient care, and some demographic characteristics. It will take you about *8-15 minutes* to complete the survey. Your response to this questionnaire is considered as your implied consent. Please mail back the survey directly to the researcher in the attached envelope.

Some of the survey questions may make you feel uncomfortable or raise unpleasant memories. You are free to skip any question.

We will do our best to protect the information we collect from you. Information that identifies you will be kept secure (i.e. hospital name). The survey itself will not include details that directly identify you, such as your name or address. Please do not put this information on your survey. The completed surveys will be kept secure and separate from information that identifies you. Only a small number of researchers will have direct access to completed surveys. If this study is published or presented at scientific meetings, names and other information that might identify you will not be used.

You can talk with the study researcher about any questions, concerns, or complaints you have about this study. Contact the study researcher Jose J. Dy Bunpin III at 415-596-8804 or jose.dybunpin@ucsf.edu.

If you wish to ask questions about the study or your rights as a research participant to someone other than the researchers or if you wish to voice any problems or concerns you may have about the study, please call the UCSF Office of the Committee on Human Research at 415-476-1814.

Your answers to the questions posed in this questionnaire will provide us with insight as to how you as a registered nurse perceive your own innovative behavior, and also how you perceive research utilization and the quality and safety of patient care in your organization. This will assist us in understanding the different variables that have a relationship to research utilization in practice.

Sincerely,

JOSE J. DY BUNPIN III, RN, MBA, PhD(c)
Doctoral Candidate
Department of Social and Behavioral Sciences
University of California-San Francisco

SUSAN CHAPMAN, RN, PhD
Faculty Adviser
Department of Social and Behavioral Sciences
University of California-San Francisco

Please CIRCLE the number or letter that best corresponds to your answer.

Innovation is a process involving the generation, promotion, and implementation of ideas. As such, it requires a wide variety of specific behaviors on the part of individuals. While some people might be expected to exhibit all the behaviors involved in innovation, others may exhibit only one or a few types of behavior. Please rate yourself on the extent to which you:	Not at all	Seldom	Sometimes	Often	To an exceptional degree
1. Search out new technologies, processes, techniques, and/or product ideas.	1	2	3	4	5
2. Generate creative ideas.	1	2	3	4	5
3. Promote and champion ideas to others.	1	2	3	4	5
4. Investigate and secure funds needed to implement new ideas.	1	2	3	4	5
5. Develop adequate plans and schedules for the implementation of new ideas.	1	2	3	4	5
6. Are innovative.	1	2	3	4	5

Please indicate the extent to which you agree that the following items are present in your current job. Indicate the degree of agreement or disagreement by selecting the appropriate number.	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree
7. Support for new and innovative ideas about patient care.	1	2	3	4
8. Nursing controls its own practice.	1	2	3	4
9. Freedom to make important patient care and work decisions.	1	2	3	4
10. Not being placed in a position of having to do things that are against my nursing judgment.	1	2	3	4
11. Involvement of staff nurses in the internal governance of the hospital.	1	2	3	4

Please indicate the extent to which you agree about your relationship with your direct supervisor. Indicate the degree of agreement or disagreement by selecting the appropriate number.	Strongly disagree	Moderately disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Moderately agree	Strongly agree
12. I like my supervisor very much as a person.	1	2	3	4	5	6	7
13. My supervisor is the kind of person one would like to have as a friend.	1	2	3	4	5	6	7
14. My supervisor is a lot of fun to work with.	1	2	3	4	5	6	7
15. My supervisor defends my work actions to a superior, even without complete knowledge of the issue in question.	1	2	3	4	5	6	7
16. My supervisor would come to my defense even if I were “attacked” by others.	1	2	3	4	5	6	7
17. My supervisor would defend me to others in the organization if I made an honest mistake.	1	2	3	4	5	6	7

Please indicate the extent to which you agree about your relationship with your direct supervisor. Indicate the degree of agreement or disagreement by selecting the appropriate number.	Strongly disagree	Moderately disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Moderately agree	Strongly agree
18. I do work for my supervisor that goes beyond what is specified in my job description.	1	2	3	4	5	6	7
19. I am willing to apply extra efforts, beyond those normally required, to meet my supervisor's work goals.	1	2	3	4	5	6	7
20. I do not mind working my hardest for my supervisor.	1	2	3	4	5	6	7
21. I am impressed with my supervisor's knowledge of his/her job.	1	2	3	4	5	6	7
22. I respect my supervisor's knowledge of and competence on the job.	1	2	3	4	5	6	7
23. I admire my supervisor's professional skills.	1	2	3	4	5	6	7

Please indicate the extent to which you agree to the following items. Indicate the degree of agreement or disagreement by selecting the appropriate number.	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
24. People in my work always look for fresh, new ways of looking at problems.	1	2	3	4	5
25. My colleagues are always moving toward the development of new answers.	1	2	3	4	5
26. Assistance in developing new ideas is readily available.	1	2	3	4	5
27. People in my work are open and responsive to change.	1	2	3	4	5
28. In my work we take the time needed to develop new ideas.	1	2	3	4	5
29. People in my work cooperate in order to help develop and apply new ideas.	1	2	3	4	5
30. My colleagues provide and share resources to help in the application of new ideas.	1	2	3	4	5
31. My colleagues provide practical support for new ideas and their application.	1	2	3	4	5
32. My hospital is innovative.	1	2	3	4	5
33. I base my practice on research.	1	2	3	4	5
34. My nursing care decisions are based on research.	1	2	3	4	5
35. I do not use research in my day-to-day practice.	1	2	3	4	5
36. I apply research results to my own practice.	1	2	3	4	5
37. I use research findings in planning patient care.	1	2	3	4	5

38. Research helps me to validate my nursing actions.	1	2	3	4	5
39. I help others to use research in practice.	1	2	3	4	5
40. I use research to guide my nursing practice.	1	2	3	4	5
41. I am unable to use research in my work.	1	2	3	4	5
42. I seek out research related to clinical practice.	1	2	3	4	5
43. Research makes a positive difference to patient care and outcomes.	1	2	3	4	5

How often do you actually implement research when it contradicts something you…	Never	Rarely	Half the time	Usually	Often
44. Learned prior to nursing school	1	2	3	4	5
45. Learned in nursing school	1	2	3	4	5
46. Learned in your place of work	1	2	3	4	5

	Excellent	Good	Fair	Poor
47. In general, how would you describe the quality of nursing care delivered to patients on your unit?	1	2	3	4
48. How would you describe the quality of nursing care delivered on your last shift?	1	2	3	4

	Excellent	Very Good	Acceptable	Poor	Failing
49. Please give your work area/unit in this hospital an overall grade on patient safety. Mark ONE answer.	A	B	C	D	F

50. Age (in years): _____	51. How long have you been a registered nurse? (in years): _____
52. Gender: ☐ Male ☐ Female	53. How long have you worked for your current primary hospital? (in years): _____
54. What is the name of the primary hospital you currently work for?	
55. Please indicate the innovation(s) that your hospital has implemented over the past 12 months?	
56. What is your employment status with this hospital?	☐ Full-time (≥0.8 FTE) ☐ Part-time (< 0.8 FTE) ☐ Per-diem ☐Other:_____

57. What is your role in this hospital?		
☐ Staff Nurse	☐ Nurse Manager	☐ Clinical Nurse Specialist
☐ Charge Nurse	☐ Nurse Director/Executive	☐ Other (please indicate):

58. What is your highest level of education?		
☐ Associate's degree	☐ Master's degree	☐ Other (please indicate):
☐ Bachelor's degree	☐ Doctorate degree	

59. In what clinical area do you work in your primary hospital?		
☐ Medical/Surgical	☐ Telemetry	☐ Step-down/Transitional Care
☐ Geriatrics	☐ Intermediate Care	☐ Dialysis
☐ Pediatrics	☐ Psychiatric/Mental Health	☐ Work in multiple areas, do not specialize
☐ Obstetrics/reproductive health	☐ Peri-operative/Post-anesthesia	☐ Other (please indicate):
☐ Neonatal/Newborn	☐ Emergency/Trauma/Urgent Care	
☐ Oncology	☐ Critical Care	

60. Do you have specialty certification (e.g. CCRN)?	☐ Yes ☐ No
61. If YES, please indicate the type of specialty certification:	

62. Please indicate the total <u>number</u> of in-services and continuing education events you attended in the past 12 months	

63. Please write any comments you would like to share with us in the box provided below.

Items 1-6 Scott, S. G., & Bruce, R. A. (1994b). Determinants of innovative behavior: A path model of individual innovation in the workplace. *Academy of Management Journal, 37*(3), 580-607.
Items 7-11 Rafferty, A. M., Ball, J., & Aiken, L. H. (2001). Are teamwork and professional autonomy compatible, and do they result in improved hospital care? *Quality Health Care, 10 Suppl 2*, ii32-37.
Items 12-23 Liden, R. C., & Maslyn, J. M. (1998). Multidimensionality of leader-member exchange: An empirical assessment through scale development. *Journal of Management, 24*(1), 43-72.
Items 24-31 De Jong, J., & Kemp, R. (2003). Determinants of co-workers' innovative behaviour: An investigation into knowledge intensive services. *International Journal of Innovation Management (World Scientific Publishing), 7*(2), 189-212.
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Items 33-42 Champion, V. L., & Leach, A. (1989). Variables related to research utilization in nursing: an empirical investigation. *Journal of Advanced Nursing, 14*(9), 705-710.
Items 43-46, 59 Estabrooks, C. A. (1999a). The conceptual structure of research utilization. *Research in Nursing & Health, 22*(3), 203-216; Estabrooks, C. A. (1999b). Modeling the individual determinants of research utilization. *Western Journal of Nursing Research, 21*(6), 758-772; Estabrooks, C. A., Scott, S., Squires, J. E., Stevens, B., O'Brien-Pallas, L., Watt-Watson, J., et al. (2008). Patterns of research utilization on patient care units. *Implementation Science, 3*, 31. doi: 1748-5908-3-31 [pii]10.1186/1748-5908-3-31
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APPENDIX C

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