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# Patient Safety in Nursing Homes

Kali Thomas
*University of South Florida*, kalithomas23@gmail.com

# Patient Safety in Nursing Homes

by

Kali S. Thomas

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Major Professor: Kathryn Hyer, Ph.D., M.P.P
Ross Andel, Ph.D.
Laurence G. Branch, Ph.D.
Nicholas G. Castle, Ph.D.
John Ferron, Ph.D.
Hongdao (Daniel) Meng, Ph.D.
Robert Weech-Maldonado, Ph.D., M.B.A.

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## Dedication

I dedicate this dissertation to my grandparents (Granny, Granny T., and Grandpa) who have taught me so much about living and loving. They will forever remain my inspiration for long-term care research.

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## Table of Contents

List of Tables ..... iii

List of Figures ..... iv

Abstract ..... v

Chapter One: Introduction ..... 1
- Donabedian's SPO Model ..... 2
- Patient Safety Culture ..... 3
- Nursing Staff Turnover ..... 5

Chapter Two: Predictors of Patient Safety Culture Ratings in Nursing Homes ..... 7
- Introduction ..... 7
  - Theoretical Framework ..... 9
- Research Design and Methods ..... 13
  - Overview ..... 13
  - Data ..... 13
  - Sample ..... 14
  - Measures ..... 15
  - Analysis ..... 17
- Results ..... 17
- Discussion ..... 19
- Conclusion ..... 23

Chapter Three: Patient Safety Culture and the Association with Safe Resident Care in Nursing Homes ..... 28
- Introduction ..... 28
  - Patient Safety Culture ..... 28
  - Patient Safety Culture and Patient Safety Outcomes ..... 29
  - Theoretical Framework ..... 30
  - The Present Study ..... 33
- Research Design and Methods ..... 33
  - Overview ..... 33
  - Data ..... 34
  - Measures ..... 36
  - Analysis ..... 38
- Results ..... 39
  - Structure and Process (Hypothesis 1) ..... 39

Processes of Care and Outcomes (Hypothesis 2) ....39
Structure and Outcomes (Hypothesis 3) ....39
Discussion ....40

Chapter Four: Certified Nursing Assistants: Turnover and Nursing Home Patient Safety ....51
Introduction ....51
Theoretical Framework ....53
Data and Methods ....54
Overview ....54
Data ....55
Measures ....57
Analysis ....60
Results ....61
Structure and Processes of Care (Hypothesis 1) ....61
Structure and Outcomes (Hypothesis 2) ....61
Processes of Care and Outcomes (Hypothesis 3) ....62
Structure and Processes of Care, and Outcomes (Hypothesis 4) ....62
Discussion ....63

Chapter Five: Concluding Remarks ....74
Discussion of Findings ....74
Limitations ....76
Future Directions ....78

References ....82

Appendix A: Domains and Nursing Home Survey of Patient Safety Culture Questions ....94

About the Author .... End Page

## List of Tables

Table 2.1: Descriptive Characteristics of Sample ..... 25

Table 2.2: Average Percent Positive Responses and the Intraclass Correlation Coefficients for the 12 Patient Safety Culture Domains and Overall Patient Safety Culture Score ..... 26

Table 2.3: Results from Linear Regressions for the Overall Summary Score and the 12 Domains ..... 27

Table 3.1: Operational Definitions of Variables in the Analyses ..... 46

Table 3.2: Descriptive Characteristics of Facilities in Sample ..... 47

Table 3.3: Binomial Regression Models Examining the Relationship between Upper Management's Overall Patient Safety Culture Rating and Use of Physical Restraints ..... 48

Table 3.4: Binomial Regression Models Examining the Relationships among Upper Management's Overall Patient Safety Culture Rating, Use of Physical Restraints, and Falls ..... 49

Table 4.1: Variable Definitions ..... 68

Table 4.2: Descriptive Characteristics of Sample ..... 69

Table 4.3: Binomial Regression Models Predicting Processes of Care ..... 70

Table 4.4: Binomial Regression Models Predicting Falls ..... 71

Table 4.5: Binomial Regression Models Predicting UTIs ..... 72

## List of Figures

Figure 3.1: Conceptual Model of the Updated Structure, Process, Outcomes Framework for Nursing Home Patient Safety ..... 50

Figure 4.1: Structure, Process, Outcome Framework for Patient Safety for Nursing Home Patient Safety ..... 73

## Abstract

Safety of residents has gained increased popularity in recent years following a report from the Institute of Medicine attributing 98,000 hospital deaths each year to errors by staff. As a result, regulatory agencies, advocates, and health care providers have shifted their focus to understanding patient safety and developing a culture that promotes safety. However, nursing homes lag behind other health care providers in their adoption of a patient safety culture and understanding what factors affect safety in resident care. These insights are needed to ensure that nursing home residents receive the safe care.

The purpose of this dissertation is to explore factors that influence the safety of residents in nursing homes by conducting three separate studies and using Donabedian's Structure Process Outcome (SPO) framework. The first study examines facility characteristics that predict higher patient safety culture scores given by top managers among a nationally representative sample of nursing homes. Using the same sample, the second study examines the relationships among the three components of Donabedian's SPO model as they relate to patient safety: structure (patient safety culture), processes of care (restraint use) and a common patient safety outcome, resident falls. The final study uses a sample of Florida nursing homes and the SPO model to examine the relationships between nursing staff turnover, processes of care, and patient safety outcomes in nursing homes.

Findings from this dissertation can contribute to a greater understanding of what predicts higher levels of patient safety in nursing homes. In the first analysis, facility characteristics that are traditionally related to quality of care in nursing homes are predictive of higher patient safety culture scores. In the second analysis, higher ratings of patient safety culture are related to better processes of care and a decreased likelihood of resident falls. In the final analysis, results indicate that Certified Nursing Assistant (CNA) turnover had an independent effect on two patient safety outcomes, falls and UTIs, and that this effect is mediated by processes of care within the nursing home. Collectively, the findings from this dissertation may have important implications for policy makers, providers, and consumers of nursing home services.

## Chapter One: Introduction

Long-term care (LTC) is a continuum of care that attempts to help older adults promote and maintain an optimal level of functioning (Evashwich, 1995). When an older adult is no longer able to manage his or her own health with the support of home health care, nursing homes often become the next stop in the continuum of care (Goldberg, 2007). Approximately 1.4 million people aged 65 and older live in the 15,000 nursing homes in the United States (Harrington, Carrillo, & Blank, 2008). Most LTC residents are poor women and residents aged 85+ (45%) (Kovner, Mezey, & Harrington, 2002). These residents represent a vulnerable and frail subpopulation of older adults. Due to demographic changes, even despite improvements in health, education, and technology, the U.S. is likely to see an increase in the demand for nursing home services in the upcoming years. Many older adults currently, and thousands more in the upcoming years, rely on nursing homes to provide safe, 24-hour, nursing care during the later years in life. Given these trends in the changing population, it is important to understand what predicts higher levels of safety in nursing homes.

Safety of residents has gained increased popularity in recent years following a report from the Institute of Medicine (IOM; Institute of Medicine, 2000). As a result of the IOM report, public forces, and professional concerns, patient safety has become one of "the nation's most pressing challenges and a mandate for every health care organization" (p. 412) (Hemman, 2002). While the IOM report suggested that

approximately 98,000 hospital deaths each year are attributable to errors by staff, no such numbers are reported for nursing home residents. Some assume that nursing home residents are even more prone to the harmful consequences of errors because nursing home residents represent a more vulnerable population in terms of age, physical function, compromised immune systems, mental capacity, financial circumstances, low rates of family involvement, and that they require 24-hour nursing specialized care and assistance with the basic activities of daily living (Kapp, 2007).

**Donabedian's SPO Model**

More than 40 years ago, Avedis Donabedian proposed a model for assessing health care quality based on structures, processes, and outcomes (Donabedian, 1966). It has frequently been used in examining health services, patient outcomes, and nursing home quality (Davis, 1991; Mor, 2005; Wan, Zhang, & Unruh, 2006). The SPO framework has the greatest acceptance in measuring nursing home quality (Zimmerman, 2003) and has been used in hospital research to understand the structure-process connection and adverse patient safety events (El-Jardali & Lagace, 2005). Donabedian's model provides a framework that allows for an examination into how risks and hazards within the structure and process of care have the potential to cause injury or harm to residents. This model has considerable support within the health care community, is very robust in its application, and is amenable to various research questions. For this reason, we deem this framework as an effective model to examine patient safety in nursing homes.

Donabedian (1966) posited there were three categories of quality assessment: structures, processes, and outcomes. Structure is defined as the environment where care is

being provided, process is the method by which it is provided, and outcomes are the consequence of either of the two.

Structure refers to relatively stable characteristics that can affect the provision of patient safety. This definition was updated by Glickman and colleagues to include organizational attributes, such as culture, that are additional structural indicators of quality. Process assessment generally are health care practices that are examined through criteria set forth by legislative, regulatory, and professional agencies (Davis, 1991). While structures and processes are important to patient safety outcomes, they do not amount to the conclusions we can draw about quality based on patient safety outcomes. For this reason, outcome assessment is considered "the quintessential measure of quality" (Davis, p.131). Each of the three papers will utilize Donabedian's SPO framework to answer specific questions related to patient safety in nursing homes.

**Patient Safety Culture**

The IOM report found that most medical errors could be traced to problems at the systems level (Institute of Medicine, 2000). As a result of the IOM report, a new way of thinking has emerged that shifts the focus from blaming individuals to changing process and structures to prevent future errors. This change has been termed the culture of safety and emphasizes supports for providers and de-emphasizes blame and punishment (Scott-Cawiezell & Vogelsmeier, 2006). In recent years, there has been an increase in the emphasis on providing and embracing a culture of safety (Leape & Berwick, 2005). However, nursing homes lag behind some other health care providers in their adoption of a patient safety culture (Castle, 2006b; Handler et al., 2006). Many assert that there is an association between safety culture and safety outcomes, and therefore changing the safety

culture may be a necessary if not sufficient precursor to ensuring positive outcomes (Clarke, 2006; Krumberger, 2001; Mustard, 2002).

While patient safety culture is hypothesized to be linked to positive resident outcomes, research examining what predicts better safety culture remains rare. Early work in the organizational literature indicated that organizational characteristics account for a large portion of variation in attitudinal responses of the work environment and managers' performance ratings of their organization (Hulin, Horn, & Herman, 1976; Zammuto, London, & Rowland, 1982). In the nursing home literature, certain facility and market characteristics were associated with nurses' aides' ratings of patient safety culture (Castle, 2006b). Therefore, the first dissertation paper, *Predictors of Patient Safety Culture Ratings in Nursing Homes*, will examine what facility characteristics are related to the structural indicator of quality, i.e., patient safety culture, as rated by top management in nursing homes.

Linkages among the three components of Donabedian's model have been established in the nursing home quality literature. Patient safety is a tenant of nursing home quality yet the links among the three components with a focus on patient safety remains rare. Therefore, the second dissertation paper, *Patient Safety Culture and the Association with Safe Resident Care in Nursing Homes*, will examine the relationships among the three components: structure (patient safety culture), processes of care (restraint use and catheterization), and a common patient safety outcome, namely resident falls. Understanding the relationships among patient safety culture, processes of care, and patient safety outcomes may contribute to an increased emphasis on developing a culture of safety.

**Nursing Staff Turnover**

Direct care workers provide 70-80% of the hands-on, personal assistance that older adults in long-term care (LTC) facilities receive (National Clearing House of Direct Care Workers, 2006). However, limited opportunities in continuing education, career mobility, wages, and poor employment policies have led to a dearth of LTC employees and a high annual turnover rate among nurse's aides in nursing homes which range from 40 percent to more than 100 percent in some states. Turnover can often lead to increased costs to the facility, staff shortages, and ultimately problems with quality of care (U.S. Government Accountability Office, 2001). Because many infer that turnover influences resident outcomes and facility quality (e.g., (Castle, Engberg, & Men, 2007), some studies use turnover itself as a quality indicator in nursing homes (Phillips, Spector, & Takada, 1988). Turnover leads to new hires and staff shortages which often result in understaffing, overtime, and inexperience--all predictors of negative patient safety outcomes in hospitals. While there is a pervasive perception that turnover is related to quality of nursing home care, the direction of the relationship remains in question (Brannon, Zinn, Mor, & Davis, 2002; Castle, Engberg, & Men, 2007; Halbur & Fears, 1986) and has yet to be examined in relationship to patient safety outcomes. Therefore, the third dissertation paper, *Certified Nursing Assistants: Turnover and Nursing Home Patient Safety*, uses the SPO model to examine the relationships among nursing staff turnover, processes of care, and patient safety outcomes in nursing homes. Identifying organizational characteristics, such as nursing staff turnover, that influence patient safety outcomes and processes of care may contribute potential solutions to the patient safety problem such as staff retention interventions.

In summary, this doctoral dissertation is organized into three separate studies that address the primary goal of identifying factors affecting the safety of nursing home resident care using Donabedian's SPO model. Because the patient safety culture is a structural indicator for quality and is likely to affect processes of care and resident outcomes, the first study examines facility characteristics that are predictors of higher ratings of patient safety culture. In an effort to improve patient safety in nursing homes, the second paper examines the linkages among patient safety culture, processes of care, and resident outcomes. Finally, to understand how CNA turnover is related to patient safety, the third paper examines the relationship between CNA turnover and patient safety outcomes. Collectively, the findings may have important implications for understanding patient safety in nursing homes and ensuring that residents in nursing homes receive safe care. The three dissertation studies are presented in turn in the following chapters.

## Chapter Two: Predictors of Patient Safety Culture Ratings in Nursing Homes

### Introduction

The "To Err is Human" Institute of Medicine (IOM) report claimed that most medical errors could be traced to problems at the systems level (Institute of Medicine, 1999). After the IOM report, a new way of thinking emerged which shifts the focus on errors from blaming individuals to changing process and structures to prevent future errors. This change has been termed the "culture of safety" and emphasizes supports for providers, continuous quality improvement, and development of evidence-based practice for all professions (Scott-Cawiezell & Vogelsmeier, 2006). As a result of the IOM report, public forces, and professional concerns, patient safety has become one of "the nation's most pressing challenges and a mandate for every health care organization" (p. 412; Hemman, 2002). In response to this growing challenge, several national organizations have taken leadership in developing patient safety cultures (Hemman, 2002). The Agency for Healthcare Research and Quality (AHRQ) has an extensive initiative focused on improving patient safety (Risser et al., 1999). The National Patient Safety Foundation was formed to study safety and error, and applies the findings to develop approaches to encourage patient safety culture. In 2006, The Tax Relief and Health Care Act required that the Office of Inspector General (OIG) report to Congress the incidence of adverse events among Medicare beneficiaries and the actions taken by the Centers for Medicare and Medicaid Services (CMS) regarding payment and

identification of events (Department of Health and Human Services & Office of Inspector General, 2010). Since that time, patient safety and adverse events have received increased attention.

In recent years, there has been an increase in the emphasis on providing and embracing a culture of safety (Leape & Berwick, 2005). However, nursing homes lag behind some other health care providers in their adoption of a patient safety culture (Castle, 2006b; Handler, et al., 2006). While the research on patient safety culture in nursing homes is limited, it has generally indicated that nursing homes have poor perceptions of safety culture (Bonner, Castle, Men, & Handler, 2009; Castle & Sonon, 2006; Handler, et al., 2006; Hughes & Lapane, 2006; Wagner, Capezuti, & Rice, 2009; Wisniewski et al., 2007) and that they score lower than hospital ratings (N. G. Castle, L. M. Wagner, J. C. Ferguson, & S. M. Handler, 2011b; Handler, et al., 2006; Wagner, et al., 2009). Some have speculated that the lag in adoption of a safety culture in nursing homes is made even more difficult because of limited resources, high staff turnover, an educationally diverse workforce, limited leadership, and the adversarial legal, economic, political and media environment surrounding the nursing home industry (Gruneir & Mor, 2008; Kapp, 2007; Scott-Cawiezell & Vogelsmeier, 2006). Regardless of the study design, population, and measures used, all of the findings draw attention to the need for improvement in patient safety culture in nursing homes (Hughes & Lapane, 2006).

Several studies highlighted the importance of health care organizations' management in influencing patient safety (Firth-Cozens & Mowbray, 2001; Scott-Cawiezell & Vogelsmeier, 2006; White & Ketring, 2001; Wong, Helsinger, & Petry, 2002). Nurse leadership was highlighted as an important aspect in improving patient

safety culture in nursing homes (Scott-Cawiezell & Vogelsmeier, 2006; Wagner, et al., 2009). However, our understanding of the opinions of management and nurse leaders relating to patient safety culture in nursing homes is limited. There are various dimensions of patient safety culture including teamwork, communication, and response to errors. Castle and colleagues reported that low patient safety culture scores were given by administrators for all dimensions of safety (Castle, Handler, Engberg, & Sonon, 2007). However, their recent work suggests that top managers, i.e., nursing home administrators (NHAs) and directors of nursing (DONs), have a somewhat "positive outlook" on their facilities' overall patient safety culture (N. G. Castle, L. M. Wagner, J. C. Ferguson, & S. M. Handler, 2011c).

**Theoretical framework.** Donabedian established a framework for quality assessment which consists of three components: structure, process, and outcomes. Within this framework, structural indicators of quality are those that can be associated with providing care and often times reflect the capacity to provide high-quality care. The SPO framework has frequently been used in examining health services, processes of care, and resident outcomes. Glickman and colleagues posit that the health care field could benefit by broadening Donabedian's definition of structure to include organizational attributes, such as culture (Glickman, Baggett, Krubert, Peterson, & Schulman, 2007).

Early work in the organizational literature by Hulin, Horn, & Herman (1976) concluded that organizational characteristics accounted a large portion of variation in attitudinal responses of the work environment. Furthermore, Zammuto, London, & Rowland (1982) indicate that the organizational differences can have effects on managers' performance ratings of their organization. In the nursing home literature, a

study using the Hospital Survey of Patient Safety Culture reported that certain facility and market characteristics were associated with CNAs' ratings of patient safety culture (Castle, 2006b).

Patient safety culture has been suggested to be another measure of nursing home quality (Castle, 2006b) and has been linked to both patient safety and quality measures (Guldenmund, 2000). For example, some research in nursing homes has shown an association between CNAs' ratings of patient safety culture and quality indicators such as physical restraint use (Bonner, et al., 2009). Because of the relationships of the components in the SPO model, we infer that patient safety culture is related to processes of care and resident outcomes. Therefore, this paper examined facility characteristics that are related to the structural quality indicator of upper managements' ratings of patient safety culture in hopes to target facilities for improvement in their safety culture which will transfer into better processes of care and resident outcomes.

Hypotheses for this exploratory study were based on findings from previous literature. Because it has been suggested that patient safety culture is another measure of nursing home quality (Castle, 2006b; Guldenmund, 2000), we hypothesized that characteristics that are traditionally related to better nursing home quality will be associated with higher scores for all of 12 dimensions of safety. Nurse staffing has repeatedly been linked to quality in nursing homes (Castle, 2008; Castle & Engberg, 2008). In addition, nurse staffing levels have shown a relationship to patient safety-related deficiency citations (N. G. Castle, L. M. Wagner, J. C. Ferguson, & S. Handler, 2011a). Therefore, we hypothesized that higher CNA and Licensed Practical Nurse

(LPN) staffing levels and a higher proportion of Registered Nurses (RNs) would be associated with higher patient safety culture scores (Hypothesis 1).

High proportions of agency staff have also been linked to poor quality in nursing homes (Castle, 2009). Agency staff are temporary caregivers that are provided to fill positions and are believed to interrupt the continuity of care and culture of the organization. In particular, RN agency staff have been shown to have the strongest relationship with quality outcomes. Therefore, we hypothesized that high proportions of RN agency staff would be related to lower patient safety culture scores (Hypothesis 2).

Proprietary ownership is assumed by some to be related to quality of care: in the conflict between producing a profit and providing better (and perceived more expensive) quality, facilities that are for profit will opt for higher profits and quality of care will suffer. This "profit motive" is considered to be a predictor of low quality and this relationship has been documented in the literature (Harrington, Woolhandler, Mullan, Carrillo, & Himmelstein, 2001). Facility size has also been shown to be related to quality of care (Rantz et al., 2004; Wan, et al., 2006). Larger facilities may have difficulties providing close supervision of resident care and smaller facilities may allow for better managerial control. In addition to the quality literature in nursing homes, size and ownership characteristics have been demonstrated to show consistent associations with the Hospital Survey of Patient Safety Culture in hospitals (Sorra, Famolaro, Dyer, Nelson, & Khanna, 2008, 2009, 2010). Therefore, we hypothesized that smaller nonprofit facilities would have higher ratings of patient safety culture than larger for profit nursing homes (Hypothesis 3).

Chain membership has been linked to quality of care outcomes in nursing homes (Harrington, et al., 2001). Nursing homes affiliated with a multi-facility chain may have lower costs due to the perceived economies of scales, and therefore they may have more resources to devote to patient safety initiatives. Furthermore, facilities that are members of a chain are often subject to standardized training programs, and administrative, financial, and clinical processes imposed by corporate headquarters (Banaszak-Holl, Berta, Bowman, Baum, & Mitchell, 2001; Kamimura et al., 2007). Because standardization facilitates learning from each other and leads facilities to adopt practices they may not have been using previously, we hypothesized that facilities that are members of a chain would have higher patient safety culture ratings (Hypothesis 4).

In addition, previous research has indicated that hospitals have higher ratings of patient safety culture than nursing homes (Castle, et al., 2011b; Wagner, et al., 2009). Therefore, we hypothesizde that staff of hospital-based nursing homes would give higher ratings of their facilities' patient safety culture on all of the 12 dimensions than staff of free-standing nursing homes (Hypothesis 5).

The vast majority of patient safety culture research in nursing homes has used adaptations of the Hospital Survey on Patient Safety Culture (HSOPSC) which has limitations in nursing home research (Bonner, Castle, Perera, & Handler, 2008). While researchers have tried to optimize its use by changing the language, potential problems exist with the fit of this instrument in settings other than hospitals (Handler, et al., 2006). This paper is among the first to use the AHRQ Nursing Home Survey of Patient Safety Culture (NHSPSC), a survey created by AHRQ specifically for nursing home use, to provide an improved measure of nursing home patient safety culture. In addition, many

studies of patient safety culture in the nursing home and hospital literature have used small, convenience samples. This study examines data from a large nationally representative sample of nursing homes and reports findings using AHRQ's improved measure of patient safety culture for nursing homes. Finally, this study utilizes the expanded version of Donabedian's SPO model by examining predictors of a structural indicator of quality, patient safety culture, which is hypothesized to be linked to processes of care and resident outcomes. Results from this study are important to determine which facility characteristics are predictive of higher patient safety culture ratings in order to target facilities for safety culture improvement.

## Research Design and Methods

**Overview**. To examine the association between facility characteristics and patient safety culture, the study includes a nationally representative sample of 3,764 nursing homes surveyed in 2008 using the AHRQ NHSPSC. These data were merged with the 2008 Online Survey Certification and Reporting dataset (OSCAR).

**Data**. The AHRQ NHSPSC was designed after a review of the nursing home safety literature, discussions with researchers and NHAs, and modeled after the HSOPSC. The survey was piloted, revised, and then released in 2008. This questionnaire consisted of 42 5-point likert scale items that measured 12 areas of organizational culture pertaining to resident safety (see Appendix A). The domains of the instrument are: *Supervisor Expectations and Actions Promoting Resident Safety*, Cronbach's alpha (3 items) = .81; *Training and Skills*, Cronbach's alpha (3 items) = .76; *Management Support for Resident Safety*, Cronbach's alpha (3 items) = .83; *Overall Perceptions of Resident Safety*, Cronbach's alpha (3 items) = .86; *Teamwork*, Cronbach's

alpha (4 items) = .86; *Feedback and Communication About Incidents*, Cronbach's alpha (4 items) = .85; *Handoffs*, Cronbach's alpha (4 items) = .86; *Communication Openness*, Cronbach's alpha (3 items) = .84; *Compliance with Procedures*, Cronbach's alpha (3 items) = .73; *Nonpunitive Response to Mistakes*, Cronbach's alpha (4 items) = .74; *Organizational Learning*, Cronbach's alpha (4 items) = .81; and *Staffing*, Cronbach's alpha (4 items) = .71. Extensive details of the development and psychometric analyses of this instrument can be found in a web-based technical report at www.ahrq.gov/qual/nhsurvey08. The NHSPSC is also further described by Castle, Wagner, Perera, Ferguson, and Handler (2010), which includes details of the nursing home sample and scores for each item included in the questionnaire.

An agreement response scale is used in the NHSPSC. The agreement scale uses *strongly agree*, *agree*, *neither*, *disagree*, and *strongly disagree*. Each of the 12 domains are calculated as percent positive response that is based on the number of percent positive scores for the 3 or 4 items that make up each domain (Appendix A). In addition, a composite average score is derived by calculating the mean of the 12 composite scores, leading to a total of 13 dependent variables used in the analyses (Table 2.1).

Facility characteristics data come from CMS' 2008 OSCAR database. OSCAR is a national database of all nursing home survey data elements collected by state agencies during the required onsite Medicare and Medicaid Certification inspection that occurs annually.

**Sample**. A random sample of 6,000 nursing homes was used (selected from all 50 states). Only nursing homes participating in Medicare and/or Medicaid certification (which includes approximately 97% of all U.S. nursing homes) were included in the

sample. Follow-up reminder postcards were mailed 2 and 4 weeks after the survey mailing, and a repeat survey was sent after 2 months. Of the 6,000 facilities included in the sample, 4,000 returned responses from both the NHA and DON giving an analytic response rate of 67%. No significant differences on facility characteristics (i.e., bed size, ownership, chain membership, and private-pay census) existed for respondent compared to non-respondent facilities. Of this sample, 103 facilities were unable to be merged with the 2008 OSCAR because these facilities did not have a survey during that calendar year. In order to minimize erroneous data, standard procedures were used to remove outliers from the data set (Harrington, Swan, & Carrillo, 2007). Facilities with 15 or fewer beds and/or residents (88 facilities), facilities reporting less than 1 hour per resident day (HPRD) of total staffing (30 facilities), and facilities reporting no licensed nurse staffing (7 facilities), and facilities reporting greater than 100% occupancy (8 facilities) were excluded from the dataset. These facilities had a statistically significant difference between the mean percent Medicare and Medicaid residents ($t$= -10.25, p<.01 and $t$=10.0, p<.01, respectively) in that those excluded had higher Medicare and lower Medicaid than those remaining in the sample. In addition, facilities that were excluded were more likely to be not for profit ($X2$=41.01, p<.01) and have a lower acuity index score ($t$=3.9, p<.01). The two groups did not differ on LPN HPRD or chain membership. This resulted in a final sample of 3764 facilities used in the analyses.

**Measures**. The dependent variables in the multivariate analyses were the average percent positive ratings for each of the 12 patient safety culture domains as rated by the DONs and NHAs and the average patient safety culture summary score.

Our independent variables for this study were measures of staffing, size, and ownership: nurse staffing levels (CNA HPRD, LPN HPRD, and ratio of RN HPRD to total licensed nurse HPRD), RN agency staff (a dichotomous variable indicating if RN agency staff HPRD >5% of total RN HPRD), total number of beds, for profit ownership status (for profit/not for profit), chain membership (member of a chain/independent) and hospital-based (freestanding/part of a hospital).

We controlled for other facility characteristics that have been related to nursing home quality: resident payer source (percent Medicaid, percent Medicare), occupancy rate (percent occupied), and a measure of resident acuity (acuity index ranging from 0-28) (Unruh & Wan, 2004; Zhang & Wan, 2007). Low Medicaid payment rates in many states can lead to revenue constraints for nursing homes with a high Medicaid census and this is inferred to be related to poor quality of care (Grabowski, 2001). In addition, facilities use high Medicare revenues to subsidize low Medicaid payments to cover fixed and operating costs for residents (Konetzka, Norton, & Stearns, 2006). Therefore, we controlled for residents' payer sources using two variables: percent of residents whose primary payer is Medicaid and percent of residents whose primary payer is Medicare. Low occupancy in nursing homes can be a response to poor quality but can also lead to poor quality due to constrained resources. For that reason, we controlled for facility occupancy rate using a continuous variable measuring the percent of beds in the facility occupied by residents. Finally, we included a measure for resident acuity using the Cowel's Research Group's Acuity Index (a scale ranging from 0-38 where higher scores indicate more need).

**Analysis**. Analyses were conducted in SAS 9.2 (SAS Institute Inc, 2008). We calculated the percentage or mean positive response for each of the 12 patient safety culture domains, as well as the facility characteristics. Intraclass correlation coefficients (ICC) were calculated in SAS Proc Mixed to assess interrater reliability (Shrout & Fleiss, 1979). The ICC is used to assess the consistency or conformity of ratings made by DONs and NHAs and ranges from 0 to 1, with scores of 0 indicating no agreement beyond chance alone. Excellent, good, moderate, and poor agreement scores are at levels of >0.80, 0.80-0.60, 0.59-0.41 and <0.40, respectively (Castle, et al., 2011c).

Because the results indicated that there was "good" to "excellent" agreement between the DONs and NHAs on all of the domains, the scores of the DON and NHA were averaged to create an "upper management score" for each of the 12 domains. Ordinary least squares regression in SAS procedure REG was used to analyze the association of facility characteristics with the 12 patient safety culture domains and the overall patient safety culture summary score..The independent variables included staffing levels, bed size, ownership, hospital-based, and chain membership. To isolate the independent effect of these facility characteristics on the structural indicator of quality, patient safety culture, we controlled for other variables that might be related: occupancy, percent of Medicaid residents, percent of Medicare residents, and resident case mix.

**Results**

Descriptive characteristics of these 3,764 facilities are presented in Table 2.1. Nursing homes in our sample had, on average, 111 beds, two-thirds were for-profit, and had an average occupancy rate of 84% (range 15-100%). Five percent of the sample were hospital-based. Approximately 60% of residents were funded by Medicaid and 15% by

Medicare. The average CNA HPRD was 2.47, the average RN to nurse ratio was 0.28, and about 7% of facilities had 5% or more of their RN hours staffed by contracted agency staff.

Upper management in our sample rated *Teamwork* as the strongest area for most nursing homes, with an average percent positive response of 72% (Table 2.2). While this measure is the highest overall mean score, it is also the one with the lowest ICC (ICC=.65) suggesting that this measure only meets criteria for "good" interrater reliability between the NHA and DON. For context, the next lowest ICC was .83 (*Staffing*).

Areas with potential improvement for most nursing homes were *Training and Skills* and *Communication Openness*. Both these dimensions had high ICCs suggesting that they had "excellent" agreement between DONs and NHA. *Training and Skills* received the lowest average ratings (an average percent positive rating of 54%). These items measure the extent to which staff receive enough training and understand the training. *Communication Openness* measured the extent to which staff can freely speak up if they see something that may negatively affect a patient and the extent to which staff's ideas, opinions, and suggestions are valued. DONs and NHAs in our sample had an average percent positive rating of 55%.

When looking at the relationship of facility characteristics and patient safety culture, results from the linear regressions of the upper management responses indicated that staffing levels were associated with patient safety culture scores, supporting Hypothesis 1 (Table 2.3). Higher CNA staffing levels were associated with higher ratings on the overall patient safety culture score and on 11 of the 12 domains. In addition, a higher proportion of RN to licensed nurses were associated with higher scores on the

*Staffing, Feedback and Communication about Incidents, Overall Perceptions of Resident Safety, and the Organizational Learning domains*. Supporting Hypothesis 3, larger facilities were significantly associated with lower scores the overall patient safety culture score and on nine domains: *Teamwork, Staffing, Training and Skills, Handoffs,, Feedback and Communication about Incidents, Supervisor Expectations and Actions Promoting Resident Safety, Overall Perceptions of Resident Safety, Management Support for Resident Safety* and *Organizational Learning*. The independent variables, use of RN agency staff above 5%, profit status, chain membership, and being hospital-based, were not significantly associated with the overall patient safety score nor any of the 12 patient safety culture domains as rated by nursing home upper management and did not support Hypotheses 2, 4, and 5.

Two of the control variables were predictive of differences in patient safety subscale scores. A higher occupancy rate was associated with higher upper management scores on the *Teamwork* subscale and a higher resident acuity index was significantly associated with lower scores on *Feedback and Communication about Incidents*.

**Discussion**

Results from these analyses indicate that facility characteristics are related to the structural quality indicator of upper managements' patient safety culture scores. Consistent with Hypothesis 1, we found that higher CNA and a higher proportion of RN to nurse staffing levels were significantly associated with higher patient safety culture scores. Several authors have identified relationships between higher nurse staffing levels and better quality of care (e.g., Castle, 2008). Our results suggest that facilities with more staff are also likely to have better patient safety culture as rated by both DONs and

NHAs. Future research should examine if the relationship between number of staff and patient safety culture is one of causation or correlation.

Consistent with Hypothesis 3, previous studies using the Hospital Survey of Patient Safety Culture (Castle, Handler, et al., 2007), and research examining nursing home quality, the size of the facility (as measured by number of beds) was significantly related to a number of the domains, suggesting that smaller facilities are better able to instill a culture of safety and therefore may look more favorable on their facility's culture. In addition, upper management in smaller facilities may be more familiar with staff and patient safety concerns. The hospital literature suggests that hospital management (clinical managers, directors, and educators) have a more positive view of safety climate due to availability of patient safety information and management's role in identifying and resolving patient safety concerns (Kho, Carbone, Lucas, & Cook, 2005). The same could be said for nursing home upper management.

Higher resident acuity was associated with lower patient safety culture scores for the dimension of *Feedback and Communication about Incidents*. This finding causes concern considering the increasing acuity levels in the past few years and the projected continuation of these increases (Decker, 2005; Z. Feng, Grabowski, Intrator, & Mor, 2006). High-acuity residents are associated with correspondingly high-care costs and therefore may affect a facility's ability to implement safe care practices. Oftentimes the reimbursement does not adequately capture residents' costs and therefore quality of care may suffer. Further analyses are needed to examine the relationship between resident acuity and ratings of patient safety culture.

A higher occupancy rate was associated with higher ratings of *Teamwork*. It can be speculated that a higher occupancy rate reduces the facility's concern about financial performance because higher occupancy rates are associated with lower average per diem costs (Holmes, 1996). Previous research has shown a relationship between high occupancy and benefits offered to nursing assistants (Temple, Dobbs, & Andel, 2010). Because benefits have been demonstrated to be important for recruitment and retention of nursing staff, perhaps staff in facilities with higher occupancy rates are afforded more benefits making them more satisfied workers and therefore more willing to work as a team. In addition, previous research has indicated that lower occupancy rates were related to CNA work dissatisfaction as measured by CNAs considering searching for a new job (Castle, Engberg, Anderson, & Men, 2007). A high occupancy rate could therefore be associated with a less stressful work environment in which staff treat each other with respect, support one another, and feel like they are a part of team.

The findings from this study have implications for policy and practice. Patient safety culture is considered a structural indicator for quality. Because Donabedian's model suggests that structures are related to processes of care and outcomes, we can assume that better patient safety culture would be associated with better processes of care and outcomes. With CMS' "pay-for-performance (P4P)" initiative, nursing homes are rewarded financially based on providing high quality care or demonstrating improvements in care. A variety of measures are used to monitor nursing home performance: avoidable hospitalizations, deficiency citations, staffing levels, and quality measures. A change in patient safety culture requires a facility-wide focus on improving care in many different areas in an effort to achieve better resident outcomes. Therefore

providers might improve both quality and financial performance with an increased emphasis on patient safety culture.

Nurse staffing levels are associated with patient safety culture as indicated by our study. In addition to the association with quality of care as demonstrated by other studies, findings from this study highlight the benefit of increased staffing levels, particularly for CNAs. Nurse staffing levels are easier to modify than many other factors (i.e. size, resident acuity, and occupancy in this study) that can contribute to patient safety. The John A Hartford Foundation, National Citizens' Coalition for Nursing Home Reform, and CMS all indicate that minimum CNA staffing levels should be above 2.9 HPRD in order to achieve good resident outcomes. Policy makers and providers should take heed to these suggested staffing levels as increased staffing levels are also associated with better quality as measured by patient safety culture.

Many believe that public reporting of nursing home quality prompts providers to improve care to be competitive in the market. Studies have found improved quality outcomes for residents following public reporting of quality measures in nursing homes (Mukamel, Spector, Zinn, Weimer, & Ahn, 2010; Mukamel, Weimer, Spector, Ladd, & Zinn, 2008; R. Werner, Stuart, & Polsky, 2010). Following this logic, perhaps making objective measures of patient safety culture available to consumers as a component of quality will prompt improvements in safety culture and encourage providers to be more responsive to the patient safety movement.

While our study does have noteworthy findings, it also has some limitations. Because respondents consisted only of upper management, it is not possible to ascertain if different workers would provide the same ratings. Future research should survey

different types of staff in order to provide a more thorough view of the facility's culture. In addition, data on the demographics of the respondents or their familiarity with patient safety culture are absent and these may influence raters' perceptions of their facilities' patient safety culture. However, research has shown that structural characteristics account for a larger portion of variance in workers' ratings of attitudes toward their jobs than demographic characteristics (Herman, Dunham, & Hulin, 1975). Finally, while patient safety culture is suggested to be related to quality, it is important to note that this study does not provide any specific evidence that high ratings are related to better patient care. Future research should examine the relationship between ratings and quality as measured through patient safety errors as the link to actual outcomes is not well established in nursing homes. Additionally, there is no definitive "high" and "low" patient safety culture score. Therefore, the results from this study only indicate what is associated with a "higher" or "lower" score for facilities in our sample. Future research should examine the various cut points for scores and objective measures of culture that are attributable to differences in care and resident outcomes.

**Conclusion**

Findings from these analyses point to the need for targeting improvement in certain elements of safety culture in nursing homes (such as *Communication Openness* and *Skills and Training),* and that greater improvement needs to be obtained in certain types of facilities (larger facilities with a low percent of Medicare residents a high resident acuity index, and a low ratio of nursing staff to residents). Results from this survey can prompt motivation for improvement activities and certain facilities should be targeted for these types of improvements in their patient safety culture.

Nursing homes can improve their facilities' safety when the leaders instill a culture where staff are enabled to openly share safety information. It is important that leaders are visibly committed to change and provide resources to achieve desired results. Because it takes a while for culture to change, it is important that top managers maintain a consistent and sustained message about safety.

Table 2.1: Descriptive Characteristics of Sample

| Variable | *M (SD) or %* | Range |
|---|---|---|
| *Independent Variables* | | |
| CNA HPRD | 2.54 (0.99) | 0-18.81 |
| LPN HPRD | 0.95 (0.67) | 0-20.26 |
| RN to Nurse Ratio | 0.28 (0.20) | 0-1 |
| RN Agency Staff > 5% (%) | 6.85 | - |
| Hospital Based (%) | 5.26 | - |
| For Profit Ownership (%) | 67.99 | - |
| Total Beds/10 | 11.10 (6.50) | 1.5-88.9 |
| Member of a Chain (%) | 39.80 | - |
| *Control Variables* | | |
| Medicaid Residents | 60.97 (22.10) | 0-100 |
| Medicare Residents | 14.63 (13.69) | 0-100 |
| Occupancy | 83.59 (14.87) | 8-100 |
| Resident Acuity Index | 10.17 (1.51) | 3.9-20.5 |

Note: N= 3,764; *M*= Mean; *SD*= Standard Deviation; CNA= Certified Nursing Assistant; HPRD= Hours per Resident Day; LPN= Licensed Practical Nurse; RN= Registered Nurse

Table 2.2: Average Percent Positive Responses and the Intraclass Correlation Coefficients for the 12 Patient Safety Culture Domains and Overall Patient Safety Culture Score

| Domain | Mean (SD) | ICC |
|---|---|---|
| Teamwork | 72.83 (15.57) | 0.65 |
| Staffing | 68.59 (17.96) | 0.83 |
| Compliance With Procedures | 58.47 (24.17) | 0.89 |
| Training and Skills | 54.33 (25.98) | 0.90 |
| Nonpunitive Response to Mistakes | 61.65 (21.88) | 0.90 |
| Handoffs | 59.09 (23.93) | 0.90 |
| Feedback and Communication About Incidents | 66.17 (19.79) | 0.84 |
| Communication Openness | 55.44 (25.58) | 0.90 |
| Supervisor Expectations and Actions Promoting Resident Safety | 64.35 (20.67) | 0.92 |
| Overall Perceptions of Resident Safety | 61.38 (22.54) | 0.94 |
| Management Support for Resident Safety | 68.03 (17.79) | 0.84 |
| Organizational Learning | 64.39 (20.80) | 0.85 |
| Overall Summary Score | 62.90 (20.44) | 0.99 |

Note: SD= Standard Deviation; ICC= Intraclass Correlation Coefficient

Table 2.3: Results from Linear Regressions for the Overall Summary Score and the 12 Patient Safety Culture Domains

| | Overall Summary Score | Teamwork | Staffing | Compliance With Procedures | Training and Skills | Nonpunitive Response to Mistakes | Handoffs | Feedback and Communication About Incidents | Communication Openness | Supervisor Expectations and Actions Promoting Safety | Overall Perceptions of Resident Safety | Management Support for Resident Safety | Organizational Learning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Estimate (SE) | Estimate (SE) | Estimate (SE) | Estimate (SE) | Estimate (SE) | Estimate (SE) | Estimate (SE) | Estimate (SE) | Estimate (SE) | Estimate (SE) | Estimate (SE) | Estimate (SE) | Estimate (SE) |
| Intercept | 63.30 *** | 72.91 *** | 68.18 *** | 59.56 *** | 55.69 *** | 59.48 *** | 62.64 *** | 66.59 *** | 55.27 *** | 64.70 *** | 68.12 *** | 62.65 *** | 63.27 *** |
| | (3.48) | (2.64) | (3.05) | (4.12) | (4.42) | (4.08) | (3.72) | (3.37) | (4.36) | (3.52) | (3.02) | (3.83) | (3.54) |
| *Independent Variables* | | | | | | | | | | | | | |
| CNA HPRD | 1.18 * | 0.86 * | 1.04 * | 1.32 * | 1.40 * | 1.48 ** | 1.23 * | 1.05 * | 1.46 * | 1.00 * | 0.82 | 1.35 * | 1.17 * |
| | (0.49) | (0.37) | (0.43) | (0.58) | (0.62) | (0.57) | (0.52) | (0.47) | (0.61) | (0.49) | (0.42) | (0.54) | (0.50) |
| LPN HPRD | -0.63 | -0.35 | -0.39 | -0.67 | -1.25 | -0.79 | -0.59 | -0.53 | -0.80 | -0.41 | -0.56 | -0.75 | -0.49 |
| | (0.59) | (0.45) | (0.52) | (0.70) | (0.75) | (0.69) | (0.63) | (0.57) | (0.74) | (0.60) | (0.51) | (0.65) | (0.60) |
| RN to Nurse Ratio | 3.63 | 1.69 | 3.52 * | 3.53 | 3.41 | 3.13 | 4.07 | 3.96 * | 4.19 | 3.65 | 3.69 * | 3.65 | 4.65 * |
| | (1.96) | (1.49) | (1.72) | (2.32) | (2.49) | (2.29) | (2.09) | (1.89) | (2.45) | (1.98) | (1.70) | (2.16) | (1.99) |
| RN Agency Staff > 5% | 0.82 | 0.81 | 0.95 | 0.73 | 1.35 | 1.17 | 1.22 | 0.26 | 0.93 | 1.09 | 0.78 | 0.67 | 0.15 |
| | (1.35) | (1.02) | (1.18) | (1.60) | (1.71) | (1.58) | (1.44) | (1.30) | (1.69) | (1.36) | (1.17) | (1.49) | (1.37) |
| Hospital Based | 1.99 | 0.74 | 1.82 | 2.63 | 3.44 | 1.97 | 2.39 | 1.26 | 2.99 | 1.27 | 1.45 | 2.58 | 1.22 |
| | (1.73) | (1.32) | (1.52) | (2.05) | (2.20) | (2.03) | (1.86) | (1.68) | (2.17) | (1.75) | (1.51) | (1.91) | (1.76) |
| For Profit Ownership | -0.56 | -1.09 | -0.63 | -0.48 | -0.22 | -0.39 | -0.05 | -0.40 | -0.33 | -0.97 | -1.01 | -0.62 | -0.90 |
| | (0.82) | (0.62) | (0.72) | (0.97) | (1.04) | (0.96) | (0.88) | (0.79) | (1.03) | (0.83) | (0.71) | (0.90) | (0.83) |
| Total Beds/10 | -0.13 * | -0.15 *** | -0.13 ** | -0.12 | -0.14 * | -0.11 | -0.12 * | -0.11 * | -0.13 | -0.16 ** | -0.13 ** | -0.15 * | -0.15 ** |
| | (0.05) | (0.04) | (0.05) | (0.06) | (0.07) | (0.06) | (0.06) | (0.05) | (0.07) | (0.05) | (0.05) | (0.06) | (0.06) |
| Member of a Chain | -0.45 | -0.32 | -0.49 | -0.69 | -0.89 | -0.54 | -0.43 | -0.35 | -0.17 | -0.24 | -0.31 | -0.45 | -0.56 |
| | (0.70) | (0.53) | (0.62) | (0.83) | (0.89) | (0.82) | (0.75) | (0.68) | (0.88) | (0.71) | (0.61) | (0.77) | (0.71) |
| *Control Variables* | | | | | | | | | | | | | |
| Occupancy | 2.35 | 3.58 * | 3.79 | 1.02 | 0.95 | 1.91 | 1.72 | 3.15 | 0.41 | 3.20 | 3.07 | 1.65 | 3.52 |
| | (2.32) | (1.77) | (2.04) | (2.75) | (2.96) | (2.73) | (2.49) | (2.25) | (2.91) | (2.35) | (2.02) | (2.56) | (2.36) |
| Medicaid Residents | -0.01 | -0.01 | -0.01 | -0.02 | -0.02 | -0.01 | -0.02 | -0.01 | -0.01 | -0.01 | -0.01 | -0.02 | -0.01 |
| | (0.02) | (0.02) | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) | (0.02) | (0.02) |
| Medicare Residents | 0.04 | 0.06 | 0.05 | 0.04 | 0.04 | 0.05 | 0.03 | 0.05 | 0.06 | 0.04 | 0.05 | 0.04 | 0.05 |
| | (0.03) | (0.03) | (0.03) | (0.04) | (0.04) | (0.04) | (0.04) | (0.03) | (0.04) | (0.03) | (0.03) | (0.04) | (0.03) |
| Resident Acuity Index | -0.37 | -0.31 | -0.40 | -0.33 | -0.29 | -0.45 | -0.41 | -0.46 * | -0.29 | -0.36 | -0.31 | -0.37 | -0.32 |
| | (0.24) | (0.18) | (0.21) | (0.28) | (0.30) | (0.28) | (0.25) | (0.23) | (0.30) | (0.24) | (0.21) | (0.26) | (0.24) |

Note: *= p<.05; **=p<.01; ***= p<.001; SE= Standard Error; CNA= Certified Nursing Assistant; HPRD= Hours per Resident Day; LPN= Licensed Practical Nurse; RN= Registered Nurse

# Chapter Three: Patient Safety Culture and the Association with Safe Resident Care in Nursing Homes

## Introduction

A report released by the Institute of Medicine in 1999, *To Err is Human: Building a Safer Health System*, increased awareness of U.S. medical errors in healthcare and suggested that most medical errors could be traced to problems at the systems level. Since then, there has been a national push toward improving patient safety beginning primarily in the hospital sector. As a result of the IOM report, a new way of thinking has emerged that shifts the focus from blaming individuals to changing process and structures to prevent future errors. This change has been termed the culture of safety and emphasizes supports for providers and de-emphasizes blame and punishment (Scott-Cawiezell & Vogelsmeier, 2006).

**Patient safety culture**. In recent years, while many health care organizations have worked to develop a culture of safety (Leape & Berwick, 2005), nursing homes lag behind (Castle, 2006b; Castle, Wagner, Ferguson, & Handler, In Press; Handler, et al., 2006) and generally have poor perceptions of their facilities' safety culture (Bonner, et al., 2009; Castle & Sonon, 2006; Handler, et al., 2006; Hughes & Lapane, 2006; Wagner, et al., 2009; Wisniewski, et al., 2007). Patient safety culture has many different dimensions such as teamwork, communication, and organizational learning. Some have

speculated that the lag in adoption of a safety culture in nursing homes is made even more difficult because of limited resources, high staff turnover, an educationally diverse workforce, limited leadership, and the adversarial legal, economic, political and media environment surrounding the nursing home industry (Gruneir & Mor, 2008; Kapp, 2007; Scott-Cawiezell & Vogelsmeier, 2006). Because there is evidence for an association between safety culture and safety outcomes, changing the safety culture in nursing homes may be a necessary if not sufficient precursor to ensuring positive resident outcomes (Clarke, 2006; Krumberger, 2001; Mustard, 2002). Therefore, this study examines the relationships among ratings of patient safety culture, processes of care, and resident outcomes in nursing homes.

**Patient safety culture and patient safety outcomes**. In a review of hospital patient safety culture, several papers highlighted the relationship between better patient safety culture and positive safety outcomes (Donnelly, Dickerson, Goodfriend, & Muething, 2009; X. Feng, Bobay, & Weiss, 2008). Studies found that positive patient outcomes including lower mortality rates, lower rates of failure to rescue, decreased chances of medical errors, increases in patients' satisfaction, and more days between serious safety events were characteristics of a positive patient safety culture (Boyle, 2004; Havens & Aiken, 1999; Hoffman & Mark, 2006; Seago, Williamson, & Atwood, 2006; Singer, Lin, Falwell, Gaba, & Baker, 2009; Sokol, 2004). The evidence providing support for the link between patient safety culture and patient safety outcomes in the hospitals while limited, exists.

While the IOM report suggested that approximately 98,000 hospital deaths each year are attributable to errors, no such numbers are reported for nursing home residents.

Some assume that nursing home residents are even more prone to the harmful consequences of errors because nursing home residents represent a vulnerable population in terms of age, mental capacity, compromised immune systems, financial circumstances, low rates of family involvement, and that they require 24-hour nursing specialized care and assistance with the basic activities of daily living (Kapp, 2007). Limited research has been conducted which examines the association between patient safety culture and resident outcomes in nursing homes. In relation to resident outcomes and patient safety culture in nursing homes, poor safety culture as rated by CNAs was associated with the use of physical restraints and higher resident safety culture was associated with increased reporting of the falls that occur (Bonner, et al., 2009).

There is a growing concern and recognition of the importance in understanding what predicts higher levels of patient safety. In particular, evidence is still needed to ascertain the association between patient safety culture and actual patient safety. Therefore, using an expanded version of Donabedian's Structure, Process, and Outcome (SPO) model, this paper examines the relationships among three different patient safety indicators of quality: patient safety culture, processes of care, and patient safety outcomes.

**Theoretical framework.** More than 40 years ago, Donabedian proposed a model for assessing health care quality based on structures, processes, and outcomes (Donabedian, 1966). It has frequently been used in examining health services, patient outcomes, and nursing home quality. Structure is defined as the environment where care is being provided, process is the method by which it is provided, and outcomes are the consequence of the two. The first two dimensions, structure and process, reflect the

capacity to provide high-quality care and are therefore a necessary condition for patient safety. However, these two dimensions alone cannot be used to determine that a nursing home resident will receive high quality care. Therefore, outcomes are objective direct measures of patient safety and the SPO model looks at the relatedness of the three dimensions. SPO has been used in hospital research to understand the structure-process connection and adverse events (El-Jardali & Lagace, 2005). Donabedian's model provides a patient safety framework and allows for an examination into how risks and hazards within the structure and process of care have the potential to cause injury or harm to residents.

Glickman and colleagues posit that the health care field could benefit by broadening Donabedian's definition of structure to include organizational attributes, such as culture (Glickman, et al., 2007). The updated framework for structure includes organizational attributes which could serve as primary determinants of process and outcome quality improvement. While organizational culture has been shown to be related to quality (Shortell et al., 2000), conclusive evidence which links organizational culture with performance is lacking. In particular, there is little research which links patient safety culture with processes of care and patient safety outcomes. However, healthcare facilities have been able to maintain note-worthy quality outcomes by their adherence to a high quality culture (Glickman, et al., 2007). In addition, the business literature has shown that culture has a direct positive relationship with quality, business operation, and financial performance (Klein, Bigley, & Roberts, 1995). For this reason, patient safety culture is included as an organizational/structural attribute which may drive quality and safety improvement in long-term care facilities (see Figure 1).

Restraint use is a care process that can influence patient safety outcomes in nursing homes. Restraints, while controversial (Mukamel, 1997), have been used to prevent and decrease the number of falls and injuries (Weech-Maldonado, Meret-Hanke, Neff, & Mor, 2004) and are most common among individuals with difficulties transferring and with behavioral disorders (Mukamel, 1997). Because labor constitutes 60-70% of nursing home costs, physical restraints may also be employed as a labor-saving practice on the part of the nursing home (Grabowski, 2001). Despite their use, there is no evidence that physical restraints reduce the actual rate of falls and injuries. On the contrary, restraints have been shown to increase the likelihood of death and injures. Therefore, restraints are a quality/safety concern and the government has imposed restrictions on their use. Many researchers have identified daily physical restraint use as an indicator for quality and safety (Morris et al., 2003; Rantz, et al., 2004; Schnelle, Bates-Jensen, Chu, & Simmons, 2004; Sullivan-Marx, Strumpf, Evans, Baumgarten, & Maislin, 1999; Weech-Maldonado, et al., 2004).

Although there are numerous patient safety issues in nursing homes, falls are among the most common events(Gruneir & Mor, 2008); an average of 1.5 falls per bed per year occur in nursing homes (Rubenstein, 1997). Falls are detrimental, particularly to older adults, in that they can result in fractures (Binder, 2002), hospitalization (Roudsari, Ebel, Corso, Molinari, & Koepsell, 2005), decreased quality of life (Rubenstein, Josephson, & Robbins, 1994), and ultimately death (Rubenstein, 1997). Every year, over 10,000 adults over the age of 65 in the U.S. die as a result of an unintentional fall (Centers for Disease Control and Prevention, 2002). Falls are considered the consequence of multiple potentially modifiable risk factors (Rubenstein, 1997) and

nursing home staff play a major role in preventing falls and implementing fall prevention practices.

**The present study.** Building on previous literature and using the SPO theoretical model as framework, this study examined the relationships among the structural attribute patient safety culture, processes of care, and a common patient safety outcome, resident falls.

Hypothesis 1: Higher patient safety culture scores would be associated with better processes of care (lower prevalence rates of restraint use.)

Hypothesis 2: Poor processes of care (restraint use) would be associated with a poor patient safety outcome (resident falls) in nursing homes independent of structural characteristics.

Hypothesis 3: A higher rating on the structural attribute of patient safety culture would be associated with favorable patient safety outcomes (fewer falls) independent of processes of care in nursing homes.

## Research Design and Methods

**Overview.** This paper uses data from the 2008 OSCAR, Minimum Data Set (MDS), and the AHRQ NHSPSC. Data used for this study come from a nationally representative sample of 3,557 nursing homes that were surveyed in 2008. Variable selection was guided by Glickman et al.'s (2007) expanded SPO framework. For this cross-sectional analysis, generalized estimating equation models were used to model the relationships among structures, processes of care, and resident outcomes. Details of the data sources, variables, and analyses will follow.

**Data**. This study uses the AHRQ NHSPSC, a survey created specifically for nursing home settings to measure patient safety culture in a large nationally representative sample of nursing homes. After a review of the nursing home safety literature, discussions with researchers and NHAs, and modeled after the HSOPSC, the instrument was piloted, revised, and then released in 2008. The final questionnaire consisted of 42 5-point likert scale items that measured 12 areas of organizational culture pertaining to nursing home resident safety (see Appendix A). The domains of the instrument are: *Supervisor Expectations and Actions Promoting Resident Safety*- Cronbach's alpha (3 items) = .81; *Training and Skills*- Cronbach's alpha (3 items) = .76; *Management Support for Resident Safety*- Cronbach's alpha (3 items) = .83; *Overall Perceptions of Resident Safety*- Cronbach's alpha (3 items) = .86; *Teamwork*- Cronbach's alpha (4 items) = .86; *Feedback and Communication About Incidents*- Cronbach's alpha (4 items) = .85; *Handoffs*- Cronbach's alpha (4 items) = .86; *Communication Openness*- Cronbach's alpha (3 items) = .84; *Compliance with Procedures*- Cronbach's alpha (3 items) = .73; *Nonpunitive Response to Mistakes*- Cronbach's alpha (4 items) = .74; *Organizational Learning*- Cronbach's alpha (4 items) = .81; and *Staffing*- Cronbach's alpha (4 items) = .71. [Extensive details of the development and psychometric analyses of this instrument can be found in a web-based technical report at www. ahrq. gov/qual/nhsurvey08/. Confirmatory factor analyses, model fit statistics, reliability analyses, and validity analysis of the safety culture domains of the NHSPSC all met the criterion for good conformance.

Of the 6,000 facilities included in the sample, 4,000 returned responses from both the NHA and DON, giving an analytic response rate of 67%. No significant differences

on facility characteristics (i.e., bed size, ownership, chain membership, and private-pay census) existed for respondent compared to non-respondent facilities. Of this sample, 103 facilities were unable to be merged with the 2008 OSCAR because these facilities did not have a survey during that calendar year. Hospital-based nursing homes were excluded because they tend to staff differently from free-standing nursing homes and it may be more appropriate for these settings to consider using the HSOPSC; this exclusion left a total of 3613 nursing homes. In order to minimize erroneous data, standard procedures were used to remove outliers from the data set (Harrington, et al., 2007). Facilities with 15 or fewer beds and/or residents (45 facilities), facilities reporting less than 1 HPRD of total staffing (7 facilities), and facilities reporting no licensed nurse staffing (4 facilities) were excluded from the dataset. These facilities had a statistically significant difference between the mean percent Medicare and Medicaid residents ($t= -2.9$, $p<.01$ and $t=2.8$, $p<.01$, respectively) in that those excluded had higher Medicare and lower Medicaid than those remaining in the sample. Those excluded did not significantly differ on ownership or chain membership. The final sample consisted of 3,557 facilities.

Structure data came from Center for Medicare and Medicaid Services' 2008 OSCAR database. OSCAR is a national database of all nursing home data elements collected by state survey agencies during the required onsite Medicare and Medicaid Certification inspection that occur annually. OSCAR provides information on facility characteristics, resident census, conditions of residents and deficiency measurements.

Data on processes of care and patient safety outcomes came from the 2008 MDS. The MDS is used to collect uniform resident information on all nursing home residents admitted to any Medicare or Medicaid certified facility. The MDS includes data on over

400 assessment items which measure clinical, functional, behavioral, and social needs of residents. All Medicare and Medicaid certified facilities are mandated to gather and report MDS data on admission, every three months, or when a resident has a change in health status. Because short-stay residents are often funded by Medicare and may be served in separate areas of the facility with different care staff, they were excluded from this analysis. Data for these analyses include long-stay residents defined as those with any assessment recorded in calendar year 2008 who had a minimum of two prior assessments to establish a continuous residence in a nursing home of at least ninety days. If multiple assessments satisfying these criteria were identified for the same resident, the one dated closest to year end (2008) was retained for analysis. Therefore, all initial assessments, readmissions, and discharge assessments are excluded leaving a sample of 375,770 long-stay resident assessments from 3,557 nursing homes.

**Measures.** Various measures of structure were included in these models. The primary independent variable in the SPO models was upper managements' overall patient safety culture score. This score was derived by calculating the mean percent positive scores for each of the 12 domains as rated separately by NHAs and DONs. Their two scores were then averaged to create the upper management's overall patient safety culture score. Patient safety culture was also examined using upper managements' ratings of 12 the domains identified in the instrument to determine the independent effect of particular patient safety culture elements. Examining each of the 12 domains as independent predictors in addition to the overall summary score is beneficial because, to date, there has not been work published which focuses on what aspects of patient safety culture have the most influential relationship on processes of care and patient safety outcomes.

Structural components that are linked to nursing care processes (such as restraint use) as well as resident outcomes were also included in the models so that the influence of patient safety culture on restraint use and resident falls could be interpreted independent of their effect. These components included facility size, nurse staffing levels, and ownership (Unruh & Wan, 2004). Based on Unruh and Wan's review, we include ownership (for profit/not), chain membership (member of a chain/not) resident payer source (percent Medicaid, percent Medicare), nurse staffing levels (CNA HPRD, LPN HPRD, and proportion of RN HPRD to total licensed nurse HPRD) and facility size (total number of beds) as control variables. Additionally, we included the facility occupancy rate and proportion of RN agency staff (greater than 5%) as lower occupancy and higher RN agency staff have been found to be related to poorer quality in nursing homes (Unruh & Wan, 2004; Zhang & Wan, 2007). A summary of the operational definitions of these variables are presented in Table 3.1.

While there are a variety of measures that can be used as measures of care processes, in an effort to avoid the issue of orthogonal measures and retain parsimony, use of physical restraints was chosen as the process measure of safety. Physical restraint use has high levels of reliability and validity and has been used frequently in the literature as a measure for quality and safety (Morris, et al., 2003; Rantz, et al., 2004; Schnelle, et al., 2004; Sullivan-Marx, et al., 1999; Weech-Maldonado, et al., 2004). Restraint use was defined as residents who were physically restrained (chair, trunk, or limb) on a daily basis during the past 7 days of the target MDS 2.0 assessment (items P4c, or P4d, or P4e=2). While some researchers have risk adjusted this measure (Arling, Lewis, Kane, Mueller, & Flood, 2007) we follow CMS' standard for risk adjusting publicly reported quality

measures and therefore do not risk adjust for physical restraints (Abt Associates Inc., 2004).

Although there are numerous safety issues in nursing homes, we examined the most frequently reported adverse event in nursing homes: falls (Gruneir & Mor, 2008). The measure for fall is obtained from the MDS 2.0 indicating that the resident has fallen in the past 30 days (J4a = 1). Further clarification from CMS instructs the nursing home to consider the following circumstances as falls: resident lost their balance, and was lowered to the floor by staff; resident fell to the floor, but there was no injury; resident was found on the floor, but the means by which he/she got to the floor was unwitnessed; resident rolled off a mattress that was on the floor. Following CMS' guidelines, we do not risk adjust for falls (Abt Associates Inc., 2004).

**Analysis**. The data for the subsequent analyses arise from a clustered design in which residents are nested in facilities. Therefore, we assume that there exists some correlation between residents within a nursing home. In addition, restraint use and falls are measured as yes/no dichotomies, hence precluding the use of conventional linear models. Therefore, we used generalized estimating equations (GEE), which can both account for clustered data and handle non-normal distributions. GEE were introduced by Liang and Zeger (1986) as an extension of generalized linear models (GLM) to analyze correlated data. We specified models with a binomial distribution, a logit link function, and an unstructured working correlation matrix in SAS procedure Genmod (SAS Institute Inc, 2008). We report the odds ratios and 95% confidence intervals for each of these models. When examining the independent effect of each of the 12 domains, we account for multiple comparisons using the Bonferonni correction (Tabachnick & Fidell, 2007).

## Results

Descriptive characteristics of the 3,557 certified free-standing nursing homes are presented in Table 3.2. On average, DONs and NHAs in our sample had a 63% positive rating on their overall patient safety culture summary score.. Nursing homes in the sample had, on average, 114 beds, 72% were for-profit, and had an average occupancy rate of 84% (range 8-100%). Sixty-two percent of residents were funded by Medicaid and 14% by Medicare. The average CNA HPRD were 2.5, the average LPN HPRD was 0.9, the average RN to total licensed nurse ratio was 0.27 and about 7% of facilities had 5% or more of their RN hours staffed by contracted agency staff.

**Structure and process (Hypothesis 1**). Higher overall patient safety culture ratings from upper management were associated with decreased odds of use of physical restraints ( see Table 3.3). In addition, a number of other structural characteristics were associated with restraint use. Residents in facilities with RN agency staffing less than 5%, those with higher CNA staffing levels, and a lower RN to nurse ratio were more likely to be restrained. Furthermore, being a resident in a facility that was a independently owned, for profit, and had a higher proportion of Medicaid funded residents was associated with higher rates of restraint use.

**Processes of care and outcomes (Hypothesis 2).** Processes of care were significantly associated with falls independent of structural characteristics (Table 3.4). Residents who were physically restrained  had almost 70% greater likelihood of falling than individuals who were not restrained.

**Structure and outcomes (Hypothesis 3).** Independent of physical restraint use which is predictive of falls, higher scores on upper managements' ratings of overall

patient safety culture were associated with decreased odds of resident falls (Table 3.4). Furthermore, residents in smaller, not for profit, chain facilities, with a lower occupancy rate, a lower CNA HPRD, and a lower proportion of Medicaid and Medicare residents were more likely to have fallen. In additional subscale analyses (results not presented), only the *Staffing* domain was significantly related to resident falls when adjusting for multiple comparisons. Residents who were in facilities with a higher rating on the *Staffing* domain were less likely to fall (OR= 0.998; 95% CI= 0.997- 0.999).

**Discussion**

Results from our study indicate that patient safety culture and restraint use are important to resident outcomes as measured by falls. Supporting Hypothesis 1 and Hypothesis 3, higher ratings for patient safety culture were related to lower prevalence of physical restraints and resident falls. Furthermore, results from this study also support Hypothesis 2: poorer processes of care (restraint use) were related to negative patient safety outcomes when controlling for structural characteristics and patient safety culture.

Higher patient safety culture summary scores were related to lower use of physical restraints. In practical terms, the findings from this study indicate a 10% increase in the patient safety culture score in an average 110 bed facility translates to 3-4 fewer residents who are restrained. Facilities with higher patient safety culture scores appear to be concerned with conforming to the national priorities to reduce restraint use. Perhaps these facilities are more aware of the various alternatives to restraints and therefore, low levels of restraint use suggest that these staff may be practicing newer methods for achieving safety. These findings suggest that investing time and energy into promoting a safety culture could result in better processes of care by reducing the use of

restraints in nursing homes. Future research should identify additional processes of care that are related to patient safety culture.

When examining the relationship of processes to outcomes (controlling for structural characteristics), restraint use was strongly associated with an increased likelihood of resident falls. Our findings confirm previous research identifying a relationship between restraint use and falls (Luo, Lin, & Castle, 2011; Parker & Miles, 1997; Rubenstein, 1997; Rubenstein, et al., 1994) and suggest that restraint use is a safety concern in nursing homes. While our study does not measure outcomes of falling, research has shown that nursing home residents who were physically restrained were more likely to be injured during a fall than those who were not restrained (Parker & Miles, 1997) and that restraints can actually increase the risk of fall-related injuries and deaths (Miles & Irvine, 1992; Rubenstein, et al., 1994).

Studies have indicated that restraint reduction has reduced the rate of fall-related injuries (Capezuti, Evans, Strumpf, & Maislin, 1996; Capezuti, Strumpf, Evans, Grisso, & Maislin, 1998; Ejaz, Jones, & Rose, 1994; Neufeld et al., 1999). These findings, in addition to a heightened concerned with quality of life of nursing home residents have led to a national effort aimed at restraint reduction in nursing homes. Some nursing home staff mistakenly believe that a resident who may be at risk for falls will be safer if physical restraints are used (Hantikainen & Kappeli, 2000) and some nursing home administrators believe that using restraints will lower falls litigation (Kapp, 2003). Several state and quality improvement organizations, nursing home associations, and medical directors have worked to educate residents, families, administrators, and caregivers about alternative methods for achieving safe outcomes without restraints. The

findings from this study support restraint reduction in nursing homes in order to enhance the quality of life of nursing home residents while assuring safety.

Findings from this study suggest that facilities' patient safety culture is related to their residents' safety. Higher ratings on overall patient safety culture, while controlling for other structural characteristics and processes of care, were associated with lower rates of falls. In practical terms, a 10% increase in the patient safety culture score in an average size facility was associated with 1-2 fewer residents who fall, independent of restraint use (which increased the odds of falling by 70%). These findings highlight the utility of developing a culture of safety: improvements in resident safety outcomes.

In further analyses examining the relationships of the various patient safety culture domains and falls, higher scores on the *Staffing* domain (reflecting a more positive impression of facility staffing) were associated with a lower likelihood of falls. These questions measured the extent to which top management believed that 1) they had enough staff to handle the workload, 2) the staff did not feel like they had to hurry because they had too much work to do, 3) the staff made sure residents needs were met during shirt change, and 4) there was ease in keeping residents safe because staff did not quit their jobs. Because there is a significant relationship between this domain and resident falls while controlling for various staffing variables, suggests that a more positive view of staffing may reflect how staff work together and have a greater impact on resident outcomes than the number or skill mix of staff in a facility. These findings offer new insight into the importance of various elements of staffing to patient safety in nursing homes. Future analyses should examine which element of patient safety culture as it pertains to staffing is predictive of safe resident outcomes.

Research findings have implications for providers and policy makers. Pay-for-performance (P4P) is a policy tool used to improve nursing home quality by offering financial incentives for nursing homes to improve the care provided to residents. Some states have begun adopting P4P through their Medicaid agencies and CMS plans to implement a P4P demonstration project (Werner, Konetzka, & Liang, 2010). Falls and physical restraints are two measures frequently included as criteria on which financial rewards are based. Therefore, because of the linkages among the various components in this study, providers should benefit financially from enhancing their patient safety culture as improved patient safety culture decreases restraint use and therefore decreases likelihood of resident falls.

Physical restraint use is a quality measure reported on Nursing Home Compare. Because this is a tool consumers use to select a nursing home, providers would benefit from developing a patient safety culture as this study has demonstrated a relationship between higher patient safety culture ratings and lower restraint use. By improving their patient safety culture, providers subsequently will improve their processes of care, and thereby improve both their quality scores and the ability to attract residents.

In order to reduce falls while promoting a safety culture, it is important for nursing home leaders to model safe behavior, provide structured pathways for communication, have routine environment and equipment safety checks, identify risks, respond appropriately to falls, and adequately document the event (Taylor et al., 2007). Staff empowerment, particularly among CNAs is one of the most important ways to promote a safe culture and decrease the number of falls (Barry, Brannon, & Mor, 2005). The main goal of staff empowerment is to train frontline staff to analyze and make

decisions that will reduce risk of adverse outcomes and this education component has been linked to decreased rates of falls in nursing homes (Ray et al., 2005).

A report from The National Quality Forum identifies 30 evidence-based practices which have been shown to improve resident care and decrease adverse patient safety outcomes (The National Quality Forum, 2003). Number one on this list is "create a healthcare culture of safety." Because of the recognition of the importance of patient safety culture, it is imperative that policy makers and state agencies support and promote development of a patient safety culture in nursing homes. In addition, poor care is expensive and falls are asserted to be a preventable (and expensive) negative health outcome (Gallagher, 2011). Because our study shows that falls are significantly related to patient safety culture, investment in developing a patient safety culture, reporting patient safety scores, and promoting patient safety should result in savings to Medicare and Medicaid.

Our study is among the first to demonstrate the linkages among the various SPO components related to patient safety. However, it is necessary to note this study's limitations. Because we were only able to examine one year of data, we are not able to identify causal relationships. Future research should include a longitudinal design to track changes in culture, processes of care, and outcomes over time. In addition, the field would benefit from testing the modifiability of overall patient safety culture and the various patient safety culture domains on patient safety outcomes. While one of this study's strengths is that it presents data on the most frequently reported adverse event, falls, it is also a limitation in that it is only one measure of resident outcomes. Future research should include additional patient safety outcomes and the relationships among

outcomes. While there are some questions as to appropriateness of the fall measure, falls are recommended as a quality outcome (Mueller & Karon, 2004; Stone et al., 2007) and are influenced by the amount and quality of care received (Gruneir & Mor, 2008). Because respondents consisted only of upper management, we are not able to ascertain if different workers would provide the same ratings of their facilities' patient safety culture. Future research should survey different types of staff in order to provide a more comprehensive understanding of the facility's culture.

As Cooper (2003) stated, "the most fundamental barrier to improving the safety of patient care is the culture of healthcare organizations" (p. 212). Findings from this study suggest that a movement toward adopting a culture of safety is related to better processes of care and positive safety outcomes. With the relationships described in this study between patient safety culture and objective measures of safe care, this study calls for the development of a culture of safety in nursing homes.

Table 3.1: Operational Definitions of Variables in the Analyses

| Variable | Operational Definition | Dataset | Type of Variable |
|---|---|---|---|
| *Structure* | | | |
| Composite Patient Safety Score | Average percent positive score for the 12 dimensions | NHSPSC | Continuous |
| Occupancy Rate | Total number of residents/total number of beds (expressed as a percent) | OSCAR | Continuous |
| RN Agency Staff >5% | The RN agency staff HPRD is greater than 5% of the total RN HPRD (1 = yes, 0 = no) | OSCAR | Dichotomous |
| Member of a Chain | (1= Member of a Chain, 0= Independently Owned) | OSCAR | Dichotomous |
| For Profit Ownership | (1= For Profit, 0= Not) | OSCAR | Dichotomous |
| CNA HPRD | Total CNA hours per resident day | OSCAR | Continuous |
| LPN HPRD | Total LPN hours per resident day | OSCAR | Continuous |
| Proportion of RN to Licensed Nursing Staff | RN HPRD/Total licensed nurse (RN+LPN) HPRD | OSCAR | Continuous |
| Medicare Residents | The percentage of residents whose primary payer is Medicare | OSCAR | Continuous |
| Medicaid Residents | The percentage of residents whose primary payer is Medicaid | OSCAR | Continuous |
| Total Beds/10 | Total number of beds/10 | OSCAR | Continuous |
| *Process* | | | |
| Physical Restraints | Has either a trunk restraint, limb restraint, or a chair that prevents rising (1=yes, 0=no) | MDS | Dichotomous |
| *Outcome* | | | |
| Falls | Resident fell in last 30 days (1=yes, 0=no) | MDS | Dichotomous |

Note: OSCAR= Online Survey, Certification, and Reporting Dataset; NHSPSC= Nursing Home Survey of Patient Safety Culture; MDS= Minimum Data Set; CNA= Certified Nursing Assistant; HPRD= Hours per Resident Day; LPN= Licensed Practical Nurse; RN= Registered Nurse

Table 3.2: Descriptive Characteristics of Facilities in Sample

| | *M* (*SD*) or % | Range |
|---|---|---|
| Patient Safety Culture Score | 62.76 (20.50) | 14.4-99.65 |
| Occupancy Rate | 0.84 (0.15) | 0.08-1 |
| RN Agency Staff > 5% (%) | 6.85 | - |
| Member of a Chain (%) | 55.12 | - |
| For Profit Ownership (%) | 72.00 | - |
| CNA HPRD | 2.53 (0.98) | 0-18.81 |
| LPN HPRD | 0.93 (0.50) | 0-13.29 |
| RN to Nurse Ratio | 0.27 (0.19) | 0-1 |
| Medicaid Residents | 61.73 (20.98) | 0-100 |
| Medicare Residents | 13.96 (11.30) | 0-100 |
| Total Beds/10 | 11.37 (6.46) | 1.8-88.9 |

Note: N=3559*; M*= Mean; *SD*= Standard Deviation; CNA= Certified Nursing Assistant; HPRD= Hours per Resident Day; LPN= Licensed Practical Nurse; RN= Registered Nurse

Table 3.3: Binomial Regression Models Examining the Relationship between Upper Management's Overall Patient Safety Culture Rating and Use of Physical Restraints

| | OR | 95% CI |
|---|---|---|
| *Structure* | | |
| Patient Safety Culture Summary Score | 0.997 | (0.995 - 0.999) |
| Occupancy Rate | 0.823 | (0.606 - 1.119) |
| RN Agency Staff > 5% | 0.752 | (0.621 - 0.911) |
| Member of a Chain | 0.815 | (0.742 - 0.896) |
| For Profit Ownership | 1.296 | (1.143 - 1.469) |
| CNA HPRD | 1.090 | (1.042 - 1.140) |
| LPN HPRD | 0.948 | (0.860 1.045) |
| RN to Nurse Ratio | 0.430 | (0.313 - 0.591) |
| Medicaid Residents | 1.007 | (1.003 - 1.010) |
| Medicare Residents | 1.000 | (0.994 - 1.006) |
| Total Beds/10 | 1.006 | (0.999 - 1.012) |

Note: N= 375,770 Residents; Physical Restraints= 15,026; OR= Odds Ratio; CI= Confidence Interval; CNA= Certified Nursing Assistant; HPRD= hours per resident day; LPN= Licensed Practical Nurse; RN= Registered Nurse

Table 3.4: Binomial Regression Models Examining the Relationships among Upper Management's Overall Patient Safety Culture Rating, Use of Physical Restraints, and Falls

| | OR | 95% CI |
|---|---|---|
| *Structure* | | |
| Patient Safety Culture Summary Score | 0.999 | (0.998 - 0.999) |
| Occupancy Rate | 0.729 | (0.646 - 0.822) |
| RN Agency Staff > 5% | 0.952 | (0.889 - 1.019) |
| Member of a Chain | 1.064 | (1.027 - 1.102) |
| For Profit Ownership | 0.870 | (0.835 - 0.906) |
| CNA HPRD | 0.974 | (0.953 - 0.994) |
| LPN HPRD | 0.987 | (0.950 1.025) |
| RN to Nurse Ratio | 0.996 | (0.896 - 1.108) |
| Medicaid Residents | 0.994 | (0.993 - 0.995) |
| Medicare Residents | 0.998 | (0.996 - 0.999) |
| Total Beds/10 | 0.994 | (0.992 - 0.997) |
| *Process* | | |
| Restraint Use | 1.698 | (1.619 1.781) |

Note: N= 375,770 Residents; Falls= 49,912; OR= Odds Ratio; CI= Confidence Interval; CNA= Certified Nursing Assistant; HPRD= hours per resident day; LPN= Licensed Practical Nurse; RN= Registered Nurse

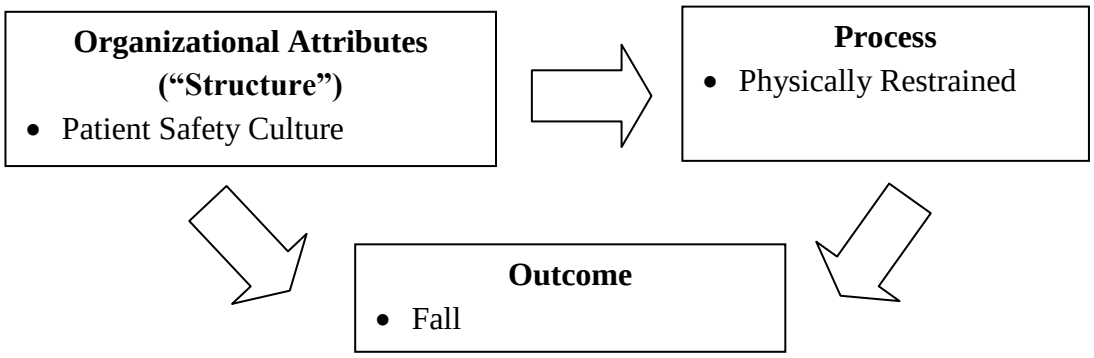


Figure 3.1: Conceptual Model of the Updated Structure, Process, Outcomes Framework for Nursing Home Patient Safety

# Chapter Four: Certified Nursing Assistants: Turnover and Nursing Home Patient Safety

## Introduction

Direct care workers provide 70-80% of the hands-on, personal assistance that elderly in long-term care (LTC) facilities receive (National Clearing House of Direct Care Workers, 2006). The two types of direct care workers in nursing homes are CNAs and licensed nurses (both LPNs and RNs). CNAs in nursing homes are often the primary caregiver and perform various direct patient care activities such as assisting residents in dressing, bathing, or eating (Gregory, 2001). In addition, strong relationships have been reported among nursing staff and long-stay residents (Bitzan & Kruzich, 1990). Mickus, Luz, and Hogan (2004) report that most direct care workers entered LTC because of their desire to help people and to provide health care for elderly individuals. However, limited opportunities in continuing education, career mobility, wages, and poor employment policies have led to a dearth in LTC employees and a high annual turnover rate among CNAs in nursing homes which range from 40 percent to more than 100 percent in some states.

Nursing staff turnover has previously been shown to influence resident care in nursing homes on at least six dimensions: (1) increase costs for the facility, therefore diverting dollars from care; (2) interfere with continuity of care; (3) increase the number

of inexperienced workers; (4) weaken standards of care; (5) cause psychological distress for some residents; and (6) increase the workload for remaining staff (Hayes et al., 2006; Knapp & Missiakoulis, 1983; Staw, 1980; U.S. Government Accountability Office, 2001). Because many assert that turnover influences resident outcomes and facility quality (Castle, Engberg, & Men, 2007), some studies use turnover, itself, as a quality indicator in nursing homes (Phillips, et al., 1988; Temple, Dobbs, & Andel, 2009).

Turnover leads to staff shortages and new hires, which often results in understaffing, overtime, and inexperience: all predictors of adverse patient safety outcomes in hospitals. Studies have shown that work duration, overtime, and number of hours worked per week had significant effects on medical errors and posed significantly greater risk to patient safety in hospitals (A. E. Rogers, Hwang, Scott, Aiken, & Dinges, 2004) (A. E. Rogers, et al., 2004; Stone, et al., 2007). Fewer years of nursing experience has been linked to increased medication errors, wound infections, and mortality (McGillis Hall, Doran, & Pink, 2004; Tourangeau, Giovannetti, Tu, & Wood, 2002). El-Jardali and Lagace (2005) report that understaffing, inadequate support services, unpleasant work environment and poor teamwork are associated with frequency of adverse events in hospitals. In addition, many studies have found associations between nurse staffing and hospital acquired pneumonia, urinary tract infection (UTI), sepsis, nosocomial infections, pressure ulcers, upper gastrointestinal bleeding, shock and cardiac arrest, medication errors and falls (Needleman & Buerhaus, 2003). These studies provide strong evidence that nurse staffing, particularly understaffing, inexperience, and overtime, has a significant effect on patient safety in the hospital setting.

There is a substantial body of literature that links nursing staff turnover and nursing home resident outcomes (Barry, et al., 2005; Castle & Engberg, 2005; Castle, Engberg, & Men, 2007). Patient safety has been considered a quality issue in nursing homes (Gruneir & Mor, 2008) and many patient safety indicators are also publicly reported nursing home quality measures/quality indicators (QMs/QIs) (e.g. falls, infections, pressure sores) (AHRQ, 2002; Zimmerman, 2003). Because the patient safety movement in nursing homes lags behind other healthcare settings (Castle, 2006b; Castle & Sonon, 2006; Handler, et al., 2006), the understanding of what factors predict better patient safety in nursing homes is limited. Therefore, this paper will examine the relationship between CNA turnover and safe resident care.

**Theoretical framework**. More than 40 years ago, Donabedian proposed a model for assessing health care quality based on structures, processes, and outcomes (Donabedian, 1966). It has frequently been used in examining health services, patient outcomes, and nursing home quality. Structure is defined as the environment where care is being provided, process is the method by which it is provided, and outcomes are the consequence of the two. The first two dimensions, structure and process, reflect the ability to provide high-quality care and are therefore a necessary condition for patient safety. However, these two dimensions alone cannot be used to determine that a nursing home resident will receive high quality care. Therefore, outcomes are objective, direct measures of patient safety and the SPO model looks at the relatedness of the three dimensions. SPO has been used in hospital research to understand the structure-process connection and adverse events (El-Jardali & Lagace, 2005). Donabedian's model

provides a patient safety framework and allows for an examination into how risks and hazards within the structure and process of care have the potential to cause injury or harm to residents.

Based on the SPO model, we hypothesized (Hypothesis 1) that higher CNA turnover would be related to poorer processes of care (higher likelihood of residents having indwelling catheters and/or physical restraints). Secondly, we hypothesized that (Hypothesis 2) higher CNA turnover (a structure measure) would be related to poorer patient safety outcomes (higher likelihood of residents falling and residents having urinary tract infections). Because processes of care are theoretically related to outcomes, we hypothesized that (Hypothesis 3) physical restraint use and indwelling catheters would be related to negative patient safety outcomes (higher likelihood of resident falls and/or higher likelihood of UTIs) when controlling for structural characteristics. Because of the paths of these expected relationships, (Hypothesis 4) processes of care are hypothesized to partially explain the association between turnover and outcomes because we hypothesize statistically significant relationships will be found among turnover and processes, turnover and outcomes, as well as processes and outcomes (see Figure 4.1).

**Data and Methods**

**Overview**. To examine the association among structure, processes, and patient safety outcomes in the nursing home, we use data from approximately 619 Florida nursing homes. The datasets used include the 2006 OSCAR, MDS, Florida Nursing Home Staffing Reports (FNHSR) and the Florida Medicaid Nursing Home Rate Setting Files. Variable selection was guided by the SPO framework.

**Data**. Turnover and staffing data come from the 2006 FNHSR. Pursuant to Florida Statutes, each facility must report to the Agency for Health Care Administration the average quarterly staff to resident ratios, number of employed staff, number of new hires, and number of terminated staff who had been employed by the facility for at least 3 months. The information is self-reported semiannually by nursing homes and subject to audit. The quarterly data are used to calculate the annual turnover rates for CNAs and the licensed nurse HPRD in these analyses.

Florida Medicaid employs a prospective cost-based payment system. The cost reports that facilities submit are used to create reimbursement rates. The Florida Nursing Home Rate Setting Files, available for every facility that receives Medicaid payment, are used to derive the calculated annual Medicaid per diem reimbursement rate.

Structure data come from CMS' 2006 OSCAR database. OSCAR is a national database of all nursing home data elements collected by state survey agencies during the required onsite Medicare and Medicaid Certification inspection that occur annually. OSCAR provides information on facility characteristics, resident census, conditions of residents and deficiency measurements.

A total of 684 facilities were in the OSCAR during 2006. Hospital-based nursing homes were excluded because they tend to staff differently from free-standing nursing homes; this exclusion left a total of 666 nursing homes. Using standard procedures, facilities with 15 or fewer beds and/or residents were also excluded from the OSCAR data (Harrington, et al., 2007). FNHSR data were cleaned using the criteria in which the staffing levels were above 5 standard deviations above/below the mean (resulting in 667

facilities with FNHSR data). The 644 facilities with Medicaid Rate Setting data were merged with the OSCAR and the FNHSR data. Free-standing facilities that had data from the FNHSR, Medicaid cost reports, and the OSCAR were retained for the analyses resulting in 619 facilities with complete data.

Data on long-stay resident characteristics, processes of care, and patient safety outcomes come from the 2006 MDS. The MDS is used to collect uniform resident information on all nursing home residents admitted to any Medicare or Medicaid certified facility. The MDS includes data on over 400 assessment items which measure clinical, functional, behavioral, and social aspects of residents. All Medicare and Medicaid certified facilities are mandated to gather and report MDS data on admission, every three months, or when a resident has a change in health status. Because short-stay residents are often funded by Medicare and may be served in separate areas of the facility with different care staff, and are less sensitive to quality of care (Konetzka, Stearns, & Park, 2008), they are excluded from this analysis. Long stay residents' conditions are better known by nursing home staff and therefore, staff members have more opportunity to provide them with maintenance and preventive services (Intrator et al., 2007). Data for these analyses include long-stay residents defined as those with any assessment recorded in calendar year 2006 who had a minimum of two prior assessments to establish a continuous residence in a nursing home of at least ninety days. If multiple assessments satisfying these criteria were identified for the same resident, the one dated closest to year end (2006) was retained for analysis. Therefore, all initial assessments, readmissions, and

discharge assessments are excluded leaving a sample of 164,916 long-stay resident assessments from 619 nursing homes.

**Measures**. The main independent structural variable is CNA turnover, a continuous variable measured by summing the terminated (both voluntary and involuntary) CNAs in each quarter and dividing by average number of CNAs employed during the year (Castle, 2006a). Other structural components that are linked to nursing care processes (such as restraint use and catheterization) as well as resident outcomes include size of the facility, nurse staffing levels, and ownership (Unruh & Wan, 2004). Based on Unruh and Wan's review, we included for profit ownership (for profit/not), chain membership (member of a chain/not), resident payer source (percent Medicaid, percent Medicare), licensed nurse staffing HPRD, and facility size (total number of beds) as measures of structure. Additionally, we included the facility occupancy rate because lower rates have been found to be related to poorer quality in nursing homes (Unruh & Wan, 2004; Zhang & Wan, 2007). As a measure of financial resources, we include the facility Medicaid reimbursement rate which has been associated with resident outcomes (Grabowski, 2001). To account for competition, we included the Herfindahl index (a proxy for market concentration) (Bloom, Alexander, & Nichols, 1992; Castle, 2005; Price & Mueller, 1981; Rosko, Chilingerian, Zinn, & Aaronson, 1995; Zinn, Aaronson, & Rosko, 1993). A summary of the operational definitions of these variables are presented in Table 4.1.

While there are a variety of measures that can be used as measures of care processes, in an effort to avoid the issue of orthogonal measures and retain parsimony,

two process measures that have high levels of reliability and validity and have been used frequently in the literature were selected as measures of quality: physical restraints and indwelling catheters.

Physical restraint use was defined as residents who were physically restrained (chair, trunk, or limb) on a daily basis during the past 7 days of the target MDS assessment (MDS 2.0 items P4c, or P4d, or P4e=2). Physical restraints, while controversial (Mukamel, 1997), have been used to prevent and decrease the number of falls and injuries (Weech-Maldonado, et al., 2004) and are most common among individuals with difficulties transferring and with behavioral disorders (Mukamel, 1997). Many researchers have identified daily physical restraint use as an indicator for quality and safety (Morris, et al., 2003; Rantz, et al., 2004; Schnelle, et al., 2004; Sullivan-Marx, et al., 1999; Weech-Maldonado, et al., 2004).

The use of indwelling catheters has also been used in previous research as an indicator of poor quality and has been repeatedly established as a quality indicator with strong reliability and validity (Morris, et al., 2003; Starkey, Weech-Maldonado, & Mor, 2005). Presence of indwelling catheters was defined as residents who had item H3d (presence of indwelling catheters) checked on their target assessment. The use of catheters is a labor-saving practice and has been shown to place individuals at higher rates of developing urinary tract infections as well as bladder and renal stones, abscesses, and renal failure (Grabowski, 2001). Previous research has shown that facilities which employ moderate to high use of catheters increase the probability that an individual will experience functional decline (Spector & Takada, 1991).

Although there are numerous safety issues in nursing homes, the outcomes used in this study of patient safety are urinary tract infections (UTI) (Nicolle, Strausbaugh, & Garibaldi, 1996; Smith & Rusnak, 1997), and falls (Gruneir & Mor, 2008). The measure for UTI is taken from the MDS item I2J and indicates if the resident had a UTI in the last 30 days. Most UTIs can be prevented by (1) keeping the area clean, (2) emptying the bladder regularly, and (3) drinking enough fluid. Not surprisingly, each of these three preventive measures require staff time, either to do the task for patients who are not able themselves, or to train and or monitor patients who are capable of that self-care. Finding the cause and getting early treatment of a UTI can prevent the infection from spreading and becoming more serious and causing complications. UTI's occur frequently enough that they are sensitive to structures and processes of care (Konetzka, et al., 2008) and have been recommended as measurable indicators of quality (Stone, et al., 2007; Zimmerman, 2003).

The measure for fall is obtained from the MDS indicating that a resident has fallen in the past 30 days (J4a = 1). Further clarification from CMS instructs the nursing home to consider the following circumstances as falls: resident lost their balance, and was lowered to the floor by staff; resident fell to the floor, but there was no injury; resident was found on the floor, but the means by which he/she got to the floor was unwitnessed; resident rolled off a mattress that was on the floor. While there are some questions as to appropriateness of the fall measure, falls are recommended as a quality outcome (Mueller & Karon, 2004; Stone, et al., 2007) and are influenced by the amount and quality of care received (Gruneir & Mor, 2008).

**Analysis**. The data included in the analyses arise from a clustered design in which residents are nested in facilities. Therefore, we assume that there exists some correlation between residents within a nursing home. In addition, processes of care (i.e., restraint use and indwelling catheters) and patient safety adverse events (i.e., falls and UTIs) are measured as yes/no dichotomies, hence precluding the use of conventional linear models. Therefore, we used generalized estimating equations (GEE), which can both account for clustered data and handle non-normal distributions. GEE were introduced by Liang and Zeger (1986) as an extension of generalized linear models (GLM) to analyze correlated data. We specified models with a binomial distribution, a logit link function, and an unstructured working correlation matrix in the SAS Procedure Genmod (SAS Institute Inc, 2008). We report the estimates (i.e., unstandardized coefficients), odds ratios, and the 95% confidence intervals for each of these models.

First, we estimated basic models examining the direct effect of CNA turnover on patient safety outcomes adjusting for various structural variables that may be related to outcomes. When the basic models yielded significant associations ($p < .05$), we examined the effect of processes of care (catheterization and physical restraints) on patient safety outcomes (falls and UTIs). To assess the proportion of the association between turnover and outcomes that was accounted for when processes of care were added to the models, we used the following formula: % explained = (Turnover estimate in basic model – Turnover estimate in the model with processes of care/Turnover estimate in basic model) × 100. We also assessed whether adding processes of care to the model improved the model fit (thereby warranting their inclusion and supporting the hypothesis of mediation)

by examining the change in the model fit statistic, QICu (Quasilikelihood under the Independence Model Criterion) (Pan, 2001) where a smaller QICu indicates a better model fit.

**Results**

Our final sample included 619 certified free-standing Florida nursing homes. Descriptive characteristics of these facilities are presented in Table 4.2. Nursing homes in the sample had, on average, 126 beds, a CNA annual turnover rate of 36%, 73% were for-profit, and had an average occupancy rate of 89% (range 23-100%). Fifty-nine percent of residents were funded by Medicaid and 19% by Medicare. The average Medicaid per diem rate in 2006 was $161.11.The average licensed nurse HPRD was 1.2.

**Structure and processes of care (Hypothesis 1).** Supporting Hypothesis 1, CNA staffing turnover was significantly related to both measures of processes of care, in that higher turnover was related to higher rates of restraint use (see Table 4.3) and catheterization (while controlling for other facility characteristics. Additionally, a lower percentage of Medicare residents, a higher percentage of Medicaid residents, and lower licensed nurse staffing levels were also significantly related to having higher rates of restraint use. Larger facilities and those with a higher percentage of Medicare residents were additional predictors of having an indwelling catheter.

**Structure and outcomes (Hypothesis 2).** The results from the basic model for resident falls indicate that higher CNA turnover was associated with increased likelihood of resident falls (see Table 4.4), independent of other indicators of structure, some of which were also related to the outcome. Specifically, being for profit, having a higher

proportion of Medicare residents, and having a lower proportion of Medicaid residents were all associated with increased resident falls.

Also supporting Hypothesis 2, the results from the basic model for UTIs indicate that higher CNA turnover was independently associated with increased likelihood of UTIs (see Table 4.5). In addition, facilities that were members of a chain, with a higher proportion of Medicare residents, and a lower proportion of Medicaid residents were associated with increased likelihood of residents having a UTI.

**Processes of care and outcomes (Hypothesis 3).** Supporting Hypothesis 3, restraint use and catheterization were significantly related to increased likelihood of resident falls when controlling for measures of structure (Table 4.4). Specifically, a resident who was restrained had a 17% increased likelihood of falling and a resident who had an indwelling catheter was at 33% greater odds of falling. Also, results indicate that catheterization was independently associated with an increased likelihood of UTIs when controlling for measures of structure in that residents who had an indwelling catheter were over 3 times more likely to develop a UTI (see Table 4.5).

**Structure and processes of care, and outcomes (Hypothesis 4).** Supporting Hypothesis 4, restraint use and catheterization mediated the relationship between CNA turnover and resident falls (see Table 4.4) as inclusion of the two variables explained away the significant association between turnover and falls. Particularly, the processes of care explained 7% of the association between CNA turnover and resident falls. Inclusion of processes of care significantly improved the model fit for the model of structure and falls with a reduction of 399 in the QICu ($p<.001$). Additionally, catheterization mediated

the relationship between CNA turnover and UTIs, explaining 42% of the association between CNA turnover and resident UTIs (see Table 4.5) and explaining away the significant relationship between turnover and UTIs. Furthermore, inclusion of catheterization significantly improved the fit of the models with UTIs as the outcome by reducing the QIC from146820 to 141448 ($p<.001$).

**Discussion**

Results from our study indicate CNA turnover has an independent effect on the patient safety outcomes of falls and UTIs. However, this effect is mediated by processes of care within the nursing home. Supporting Hypotheses 1 and 2, higher rates of CNA turnover were related to poorer processes of care (higher prevalence of physical restraints and catheterization) and worse patient safety outcomes (higher prevalence of falls and UTIs). The results also support Hypotheses 3 and 4: poorer processes of care (higher rates of physical restraints and indwelling catheters) were related to worse patient safety outcomes and explained the association between CNA turnover and patient safety outcomes.

Higher levels of CNA turnover were related to increased use of physical restraints. To put this in practical terms, the average facility in our sample employed 60 CNAs and had approximately 110 residents. Therefore, every additional 6 CNAs that left the facility during the year was associated with approximately 5 additional residents being physically restrained. High levels of restraint use suggests that staff may be using restraints instead of providing more direct care or using behavioral interventions with residents. Research has shown that some nursing home staff members have little or no

training in the appropriate use of restraints and many cannot identify alternatives to restraint use (Cohen, Neufeld, Dunbar, Pflug, & Breuer, 1996; Stilwell, 1991). Turnover and new hires are likely to compound this issue. Lower turnover rates could be related to better staff education in regard to restraint alternatives and residents' needs and thereby reflective of lower restraint use.

Higher levels of CNA turnover were associated with higher rates of catheterization. For every additional 6 CNAs that leave a facility in a year, there are approximately 8 additional residents that will have indwelling catheters. There are many alternatives to catheterization for incontinent nursing home residents. However, residents who are incontinent must first be identified, assessed, and provided appropriate treatment and services to improve and/or maintain as normal urinary function as possible. Oftentimes, that includes a toileting program which is typically intensive of staff time. Furthermore, residents who have incontinent episodes require staff time to change linens and implement appropriate hygiene actions (e.g., cleansing, rinsing, drying, and applying protective moisture barriers) (Newman, 2002; Prochoda, 2002). Because turnover leads to new hires and staff shortages which often results in understaffing, inexperience, and inconsistency in staff assignments, perhaps facilities with high turnover rates view catheterization as a labor-saving practice.

This study demonstrates, once again, that indwelling catheters are related to UTIs in nursing home residents and that indwelling catheters increases the likelihood of falls. Previous research has indicated that at least 40% of all infections seen in nursing homes are in the urinary tract system and of these infections, 80% are attributable to

catheterization (Newman, 2004; Newman, Fader, & Bliss, 2004). Our results indicate that residents who have an indwelling catheter are over 3 times more likely to develop a UTI. While many approaches have been used to minimize catheter-induced UTIs, elimination of catheter usage remains the best method. Findings from our study also indicate that residents with indwelling catheters were 33% more likely to fall. While indwelling catheters are most often used due to a resident's incontinence, they can often be placed due to a resident's fall risk. Previous research has found that individuals with diabetes mellitus, renal failure, skin conditions, deep vein thrombosis, aphasia, or end-stage disease and those who were either obese and/or taking more medications were more likely to have indwelling catheters (M. A. Rogers et al., 2008). In addition, the most common risk factors for falls include gait and balance disorders, weakness, dizziness, confusion, visual impairment, sedating and psychoactive medications and postural hypotension (Rubenstein, 2006). Because of the similarities between the residents who are at risk for falling and those who are most likely to have a catheter, the relationship between catheterization and falls may be correlated rather than a causal relationship.

Our findings support those of previous research identifying a relationship between restraint use and falls (Luo, et al., 2011; Parker & Miles, 1997; Rubenstein, 1997; Rubenstein, et al., 1994). While there has been a national movement to reduce restraint use, some nursing home staff believe that a resident who may be at risk for falls will be safer if physical restraints are used (Hantikainen & Kappeli, 2000). Furthermore, research has indicated that nursing home administrators believe that using restraints will lower falls litigation (Kapp, 2003). However, findings from our study confirm that restraint use

and rates of falls are positively related and therefore warrant reconsideration and investigation into the use of restraints among nursing home residents.

This study is among the first to demonstrate the relationship between CNA turnover, processes of care, and patient safety outcomes. Results from this study indicate that CNA turnover is related to patient safety outcomes in nursing homes. However, this relationship is explained by processes of care. In particular, findings from this study indicate that it is through poor processes of care that nursing staff turnover is related to poorer patient safety outcomes: high CNA turnover leads to poor processes of care which lead to bad patient safety outcomes. These findings propose a different way of thinking about how to combat poor quality and adverse patient safety outcomes: it is not only through staff retention strategies such as increasing wages or better management practices, but through training and educating new staff concerning how to provide safe and good quality care. Throughout the years, nursing staff turnover in nursing homes has continued to remain at high levels. Therefore, future research should examine not only how to reduce turnover, but strategies to ensure delivery of safe care in order to prevent adverse patient safety outcomes when turnover does occur.

It is necessary to note this study's limitations. Because we only examined one year of data, it is not possible to identify causal relationships. Future research should include a longitudinal design to track changes in CNA turnover, processes of care, and outcomes over time. While one of this study's strengths is that it presents data on two of the most frequently reported adverse events, falls and UTIs, it is also a limitation in that it uses only two measures of patient safety outcomes. Future research should include

additional patient safety outcomes. Because we only examined CNA turnover, we are not able to ascertain if turnover of different staff would have the same relationship with processes of care and patient safety outcomes. Future research should examine different types of staff turnover in order to provide a more thorough view of the relationship between turnover and outcomes. Furthermore, we were unable to assess whether the turnover was voluntary or involuntary which may be another measure of the facilities' quality. It is also important to note that these rates of turnover are conservative as the measure of turnover is only for CNAs employed at the nursing home for a minimum of 3 months.

In summary, patient safety research in the nursing home is lacking. This study of Florida nursing homes provides a detailed analysis of the relationships among nursing staff turnover, processes of care, and patient safety outcomes. These findings show that processes of care mediate the relationship between turnover and patient safety outcomes. Therefore, facility practices and policy initiatives should be directed toward improving the delivery of care as well as retention of staff in order to ensure that nursing home residents remain safe.

Table 4.1: Variable Definitions

| Variable | Operational Definition | Dataset | Type of Variable |
|---|---|---|---|
| *Structure* | | | |
| CNA Turnover | The average annual turnover rate of CNAs in a facility | FNHSR | Continuous |
| For Profit Ownership | (1= For Profit, 0= Not) | OSCAR | Dichotomous |
| Member of a Chain | (1= Member of a Chain, 0= Independently Owned) | OSCAR | Dichotomous |
| Medicare Residents | The percentage of residents whose primary payer is Medicare | OSCAR | Continuous |
| Medicaid Residents | The percentage of residents whose primary payer is Medicaid | OSCAR | Continuous |
| Total Beds/10 | Total number of beds/10 | OSCAR | Continuous |
| Occupancy Rate | Total number of residents/total number of beds (expressed as a percent) | OSCAR | Continuous |
| Licensed Nurse HPRD | Total licensed nurse hours per resident day | OSCAR | Continuous |
| Medicaid per Diem Rate | The payment rate for each Medicaid resident in the facility | FNHRSF | Continuous |
| Herfindahl Index | Each nursing home's squared percentage share of beds in the county, summed | OSCAR | Continuous |
| *Process* | | | |
| Physical Restraints | Has either a trunk restraint, limb restraint, or a chair that prevents rising (1=yes, 0=no) | MDS | Dichotomous |
| Indwelling Catheter | Presence of an indwelling catheter (1=yes, 0=no) | MDS | Dichotomous |
| *Outcome* | | | |
| Urinary Tract Infection | Urinary tract infection in the past 30 days (1=yes, 0=no) | MDS | Dichotomous |
| Fall | Resident fell in last 30 days (1=yes, 0=no) | MDS | Dichotomous |

Note: OSCAR= Online Survey, Certification, and Reporting Dataset; FNHSR= Florida Nursing Home Staffing Report; FNHRSF= Florida Nursing Home Rate Setting Files; MDS= Minimum Data Set; CNA= Certified Nursing Assistant; HPRD= Hours per Resident Day

Table 4.2: Descriptive Characteristics of Sample

| Variable | *M* (*SD*) or % | Range |
|---|---|---|
| CNA Turnover | 36.20 (19.06) | 1.75 - 110.34 |
| For Profit Ownership (pct) | 73 | |
| Member of a Chain (pct) | 57 | |
| Medicare Residents | 58.71 (17.34) | 0 - 95.45 |
| Medicaid Residents | 19.28 (11.13) | 0.84 - 93.75 |
| Total Beds/10 | 12.56 (4.85) | 2 - 46 |
| Occupancy Rate | 0.89 (0.09) | 0.24 - 1 |
| Licensed Nurse HPRD | 1.17 (0.22) | 0.83 - 3.90 |
| Medicaid per Diem ($) | 161.11 (13.38) | 117.31 - 219.30 |
| Herfindahl Index | 0.10 (0.17) | 0.02 - 1.00 |

Note: N=619 Nursing Homes; Std Dev= Standard Deviation; CNA= Certified Nursing Assistant; pct= percent; HPRD= hours per resident day

Table 4.3: Binomial Regression Models Predicting Processes of Care

| | Physical Restraints | | | Indwelling Catheter | | |
|---|---|---|---|---|---|---|
| | Estimate | OR | 95% CI | Estimate | OR | 95% CI |
| *Structure* | | | | | | |
| CNA Turnover | 0.527 ** | 1.694 | (1.178 - 2.436) | 0.366 ** | 1.442 | (1.160 - 1.794) |
| For Profit Ownership | -0.026 | 0.975 | (0.828 - 1.148) | 0.098 | 1.103 | (0.992 - 1.225) |
| Member of a Chain | 0.092 | 1.096 | (0.953 - 1.262) | 0.017 | 1.017 | (0.938 - 1.103) |
| Medicare Residents | -0.017 *** | 0.983 | (0.974 - 0.992) | 0.008 ** | 1.008 | (1.003 - 1.012) |
| Medicaid Residents | 0.009 ** | 1.009 | (1.003 - 1.015) | -0.004 ** | 0.996 | (0.993 - 0.999) |
| Total Beds | 0.007 | 1.001 | (0.999 - 1.002) | 0.011 *** | 1.011 | (1.004 - 1.019) |
| Occupancy Rate | 0.058 | 1.060 | (0.481 - 2.338) | -0.077 | 0.926 | (0.547 - 1.569) |
| Licensed Nurse HPRD | -0.002 | 0.998 | (0.993 - 1.003) | 0.000 | 1.000 | (0.997 - 1.003) |
| Medicaid Per Diem | -0.390 | 0.677 | (0.479 - 0.958) | -0.203 | 0.816 | (0.657 - 1.015) |
| Herfindahl Index | -0.113 | 0.893 | (0.613 - 1.302) | -0.083 | 0.921 | (0.774 - 1.096) |
| *GEE Fit Criteria* | | | | | | |
| QIC | | 63674.40 | | | 138724.98 | |
| QICu | | 63497.79 | | | 138572.46 | |

Note: UTIs= Urinary Tract Infections; OR= Odds Ratio; CI= Confidence Interval; * = $p$ <.05; ** = $p$ <.01; *** = $p$ <.001; CNA= Certified Nursing Assistant; HPRD= hours per resident day; GEE= Generalized Estimating Equation; QIC= Quasilikelihood under the Independence model Criterion; QICu= Quasilikelihood +2p, where p is the number of parameters in the model

Table 4.4: Binomial Regression Models Predicting Falls

| | Basic Model (Structure and Falls) | | | Full Model (Structure, Process, and Falls) | | |
|---|---|---|---|---|---|---|
| | Estimate | OR | 95% CI | Estimate | OR | 95% CI |
| *Structure* | | | | | | |
| CNA Turnover | 0.153 * | 1.165 | (1.003 - 1.354) | 0.142 | 1.153 | (0.992 - 1.339) |
| For Profit Ownership | 0.099 ** | 1.104 | (1.029 - 1.184) | 0.091 * | 1.095 | (1.021 - 1.175) |
| Member of a Chain | 0.023 | 1.023 | (0.965 - 1.084) | 0.024 | 1.024 | (0.967 - 1.085) |
| Medicare Residents | 0.005 ** | 1.005 | (1.001 - 1.009) | 0.005 ** | 1.005 | (1.001 - 1.008) |
| Medicaid Residents | -0.015 *** | 0.986 | (0.983 - 0.988) | -0.015 *** | 0.986 | (0.983 - 0.988) |
| Total Beds/10 | 0.002 | 1.002 | (0.996 - 1.009) | 0.001 | 1.001 | (0.995 - 1.008) |
| Occupancy Rate | -0.051 | 0.951 | (0.667 - 1.354) | -0.048 | 0.953 | (0.673 - 1.349) |
| Licensed Nurse HPRD | -0.153 | 0.858 | (0.708 - 1.040) | -0.160 | 0.852 | (0.703 - 1.033) |
| Medicaid Per Diem | 0.001 | 1.001 | (0.998 - 1.003) | 0.001 | 1.001 | (0.998 - 1.003) |
| Herfindahl Index | -0.017 | 0.984 | (0.824 - 1.174) | -0.013 | 0.987 | (0.828 - 1.176) |
| *Processes of Care* | | | | | | |
| Physical Restraints | | | | 0.156 *** | 1.169 | (1.091 - 1.251) |
| Indwelling Catheter | | | | 0.286 *** | 1.331 | (1.277 - 1.387) |
| *GEE Fit Criteria* | | | | | | |
| QIC | | 183669.45 | | | 183272.40 | |
| QICu | | 183545.03 | | | 183145.77 | |

Note: OR= Odds Ratio; CI= Confidence Interval; * = $p$ <.05; ** = $p$ <.01; *** = $p$ <.001; CNA= Certified Nursing Assistant; HPRD= hours per resident day; GEE= Generalized Estimating Equation; QIC= Quasilikelihood under the Independence model Criterion; QICu= Quasilikelihood +2p, where p is the number of parameters in the model

Table 4.5: Binomial Regression Models Predicting UTIs

| | Basic Model (Structure and UTIs) | | | Full Model (Structure, Process, and UTIs) | | |
|---|---|---|---|---|---|---|
| | Estimate | OR | 95% CI | Estimate | OR | 95% CI |
| *Structure* | | | | | | |
| CNA Turnover | 0.208 * | 1.232 | (1.035 - 1.465) | 0.120 | 1.128 | (0.941 - 1.351) |
| For Profit Ownership | 0.057 | 1.058 | (0.980 - 1.143) | 0.039 | 1.040 | (0.955 - 1.132) |
| Member of a Chain | 0.079 * | 1.083 | (1.016 - 1.153) | 0.093 ** | 1.097 | (1.027 - 1.173) |
| Medicare Residents | 0.008 *** | 1.008 | (1.004 - 1.013) | 0.005 | 1.005 | (0.999 - 1.010) |
| Medicaid Residents | -0.004 * | 0.996 | (0.993 - 0.999) | -0.002 | 0.998 | (0.995 - 1.001) |
| Total Beds/10 | -0.002 | 0.998 | (0.991 - 1.005) | -0.005 | 0.995 | (0.988 - 1.002) |
| Occupancy Rate | -0.199 | 0.820 | (0.570 - 1.179) | -0.267 | 0.766 | (0.537 - 1.093) |
| Licensed Nurse HPRD | -0.185 | 0.831 | (0.661 - 1.046) | -0.143 | 0.867 | (0.678 - 1.109) |
| Medicaid Per Diem | 0.001 | 1.001 | (0.998 - 1.003) | 0.001 | 1.001 | (0.998 - 1.003) |
| Herfindahl Index | -0.188 | 0.828 | (0.676 - 1.016) | -0.134 | 0.874 | (0.708 - 1.079) |
| *Processes of Care* | | | | | | |
| Physical Restraints | | | | 0.048 | 1.049 | (0.981 - 1.121) |
| Indwelling Catheter | | | | 1.195 *** | 3.305 | (3.177 - 3.438) |
| *GEE Fit Criteria* | | | | | | |
| QIC | | 146933.88 | | | 141573.80 | |
| QICu | | 146819.82 | | | 141448.42 | |

Note: UTIs= Urinary Tract Infections; OR= Odds Ratio; CI= Confidence Interval; * = $p$ <.05; ** = $p$ <.01; *** = $p$ <.001; CNA= Certified Nursing Assistant; HPRD= hours per resident day; GEE= Generalized Estimating Equation; QIC= Quasilikelihood under the Independence model Criterion; QICu= Quasilikelihood +2p, where p is the number of parameters in the model

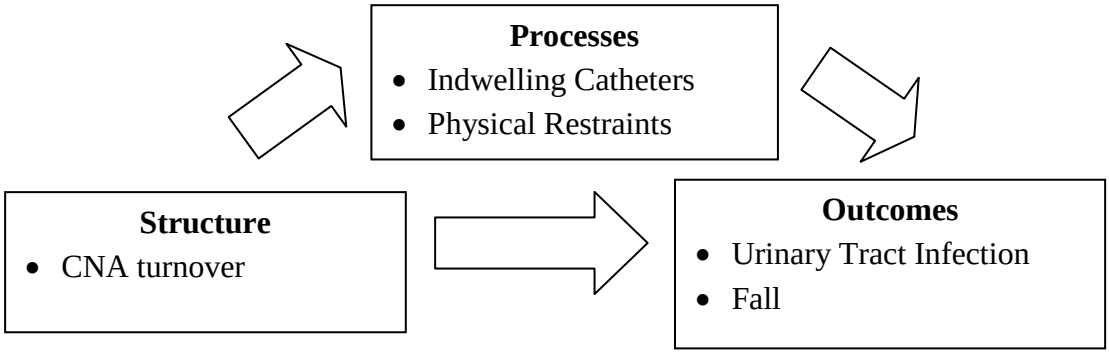


Figure 4.1: Structure, Process, Outcome Framework for Patient Safety for Nursing Home Patient Safety

# Chapter Five: Concluding Remarks

With the projected increased demand in long-term care and emphasis on patient safety in health care, it is important to understand what predicts higher levels of safety in nursing homes. In an attempt to contribute to the state of knowledge on patient safety in nursing homes, the purpose of this dissertation was to conduct three studies to understand factors affecting patient safety in nursing homes. In this section, the main findings of the three studies will be summarized and discussed. In addition, limitations of this dissertation and directions for future research will be addressed.

## Discussion of Findings

The first study offered insights into the facility characteristics that are related to upper managements' patient safety culture scores, a proposed structural indicator of quality. In addition to using a large, nationally representative sample of nursing homes, this paper is among the first to use the AHRQ NHSPSC, an improved measure of patient safety culture for nursing homes. Utilizing the expanded version of Donabedian's SPO model, results from this study indicate that many facility characteristics that are traditionally related to better nursing home quality (higher CNA HPRD, RN staffing levels, and fewer beds) were associated with higher patient safety culture scores.

Findings from these analyses point to the need for targeting improvement in certain elements of safety culture in nursing homes (such as *Communication Openness*

and *Skills and Training),* and that greater improvement needs to be obtained in certain types of facilities (larger facilities with a low ratio of nursing staff to residents). Results from this survey can prompt motivation for improvement activities and certain facilities should be targeted for improvements in their patient safety culture. Because patient safety culture is hypothesized to be linked to processes of care and resident outcomes, improving patient safety culture in nursing homes can be a key to ensuring safe care.

Also using the SPO model as the theoretical framework, the second study examined the relationships between patient safety culture, restraint use, and resident falls. Results from this study indicate that patient safety culture and processes of care are important to resident outcomes as measured by falls. Higher ratings for patient safety culture were related to lower prevalence of physical restraints and resident falls. Furthermore, results from this study indicate that poorer processes of care (restraint use) were related increased likelihood of falling when controlling for structural characteristics and patient safety culture.

The third paper provides a detailed analysis of the relationships among nursing staff turnover, processes of care, and patient safety outcomes. Results from this study indicate CNA turnover has an independent effect on two patient safety outcomes, falls and UTIs, and that this effect is mediated by processes of care within the nursing home. Higher rates of CNA turnover were independently related to poorer processes of care (higher prevalence of physical restraints and catheterization) and worse patient safety outcomes (higher prevalence of falls and UTIs). Furthermore, results indicate poorer processes of care (higher rates of physical restraints and indwelling catheters) were related to worse patient safety outcomes and explained the association between CNA

turnover and patient safety outcomes. These findings indicate that processes of care mediate the relationship between turnover and patient safety outcomes. Therefore, facility practices and policy initiatives should be directed toward improving the delivery of care in addition to retention of staff in order to ensure that nursing home residents remain safe.

Collectively, the three studies of this dissertation revealed factors that are related to patient safety in nursing homes. To address the patient safety issue among health care facilities, measures must be taken to improve patient safety culture and practices. Simply eradicating adverse events is not likely to happen; therefore, it is important that determinates (i.e. facility characteristics, turnover, and patient safety culture) of patient safety outcomes in nursing homes be examined. The results from these studies may contribute to interventions aimed at preventing patient safety errors. Results from the first study allow us to identify types of facilities to target for patient safety culture development. The second and third study suggest that interventions aimed at enhancing patient safety culture, improving the processes of care, and increasing CNA retention are needed to ensure safe outcomes for nursing home residents.

**Limitations**

Although each of the studies has unique contributions, their limitations should also be acknowledged. The first study examined facility characteristics that predicted patient safety culture as rated by upper management. Because respondents consisted only of upper management, it is not possible to ascertain if different workers would provide the same ratings. Future research should survey different types of staff in order to provide a more thorough view of the facility's culture. In addition, data on the demographics of the respondents or their familiarity with patient safety culture are absent and these may

influence raters' perceptions of their facilities' patient safety culture. However, research has shown that structural characteristics account for a larger portion of variance in workers' ratings of attitudes toward their jobs than demographic characteristics (Herman, et al., 1975). Finally, while patient safety culture is suggested to be related to quality, it is important to note that this study does not provide any specific evidence that high ratings are related to better patient care. Future research should examine the relationship between ratings and quality as measured through patient safety errors as the link to actual outcomes is not well established in nursing homes. Additionally, there is no definitive "high" and "low" patient safety culture score. Therefore, the results from this study only indicate what predicts a "higher" or "lower" score for facilities in our sample. Future research should examine the various cut points for scores that are attributable to differences in care and resident outcomes.

The second study is among the first to demonstrate the linkages among the various SPO components related to patient safety. However, it is necessary to note this study's limitations. Because we were only able to examine one year of data, we are not able to identify causal relationships. Future research should include a longitudinal design to track changes in culture, processes of care, and outcomes over time. In addition, the field would benefit from testing the modifiability of overall patient safety culture and the various domains on outcomes. While one of this study's strengths is that it presents data on the most frequently reported adverse event, falls, it is also a limitation in that it is only one measure of resident outcomes. Future research should include additional patient safety outcomes. While there are some questions as to appropriateness of the fall measure, falls are recommended as a quality outcome (Mueller & Karon, 2004; Stone, et

al., 2007) and are influenced by the amount and quality of care received (Gruneir & Mor, 2008).

The final study was limited by its cross-sectional analysis of the relationship among CNA turnover, processes of care, and patient safety outcomes. Because we only examined one year of data, it is not possible to identify causal relationships. Future research should include a longitudinal design to track changes in CNA turnover, processes of care, and outcomes over time. While one of this study's strengths is that it presents data on two of the most frequently reported adverse events, falls and UTIs, it is also a limitation in that it uses only two measures of patient safety outcomes. Future research should include additional patient safety outcomes. Because we only examined CNA turnover, we are not able to ascertain if turnover of different staff would have the same relationship with processes of care and patient safety outcomes. Future research should examine different types of staff turnover in order to provide a more thorough view of the relationship between turnover and outcomes. Furthermore, we were unable to assess whether the turnover was voluntary or involuntary which may be another measure of the facilities' quality.

**Future Directions**

This dissertation research was undertaken to examine predictors of patient safety in nursing homes. Although several important research questions addressed, other key questions beyond the scope of this dissertation remain. For example, what is the timeline for the change in culture and outcomes? What are additional patient safety outcomes in nursing homes? What other theoretical models might be suitable to examine patient

safety? What do the various dimensions of patient safety culture mean in clinical practice?

We know that culture change takes time. Leaders' commitment to support patient safety improvement must continue long enough for the idea to impact the culture of the entire organization. This has been reported to take anywhere from 3 to 5 years in some health care organizations (Spath, 2002). Future research should address the patient safety culture change over time in nursing homes as well as among different types of staff. Currently there is no central repository for submitting patient safety culture information as there is for hospitals. Therefore, it is difficult for administrators, management companies, quality improvement organizations, and researchers to benchmark and track changes over time. Furthermore, it would be of value to examine how long after undertaking a patient safety culture initiative do we see changes in processes of care and resident outcomes. This timeline remains unknown but would be of value to administrators, regulatory agencies, and consumers.

AHRQ has developed a set of patient safety indicators to capture potentially preventable adverse events that compromise patient safety in hospitals, such as surgical complications, mortality in patients with low-mortality diagnoses, and decubitus ulcers. Those that are also reported quality measures in nursing homes, such as falls and infections (specifically UTIs in Study 3) were examined as patient safety outcomes in this dissertation. Many measures of quality in nursing homes may also be measures of safety. Future research should examine other potential patient safety outcomes in nursing homes. For example, medication errors, hospitalization, and fractures are potentially preventable patient safety events in nursing homes. It would be of value to identify patient safety

indicators appropriate for nursing homes and similar to those of hospitals. Development of standardized tools to capture potentially preventable patient safety errors is a necessary step in understanding the patient safety problems in nursing homes and developing interventions designed to reduce these errors.

This dissertation uses Donabedian's SPO framework to examine various dimensions of quality and relationships among the dimensions to understand the factors predicting patient safety in nursing homes. While offering a solid building block for an initial investigation into the structures and processes of care that are related to patient safety outcomes, future research would benefit from utilizing additional theoretical models and designs to study patient safety in nursing homes.

In response to the Affordable Care Act, the Centers for Medicare & Medicaid Services is undertaking a bold initiative to broaden quality assurance and performance improvement activities (QAPI) in nursing homes. CMS is now requiring nursing homes to establish and maintain QAPI processes to improve quality of care for nursing home residents. In the hospitals, one of the federal tags deals specifically with patient safety (A-0285: 482.21 (c)(1). It is required that hospitals track patient safety adverse events and set priorities for improvement activities related to patient safety and hospitals are cited if they do not meet these standards. With the QAPI demonstration project underway in nursing homes, it is important that patient safety outcomes and QAPI programs such as developing a culture of safety be examined. This may provide ripe opportunity to ensure that safe care is being delivered to our nation's most vulnerable residents.

One final direction for future research is to further explore various measures of patient safety culture and the specific domains of patient safety culture. While there are

similarities among the various instruments, there are important differences in the dimensions measured with each. For example, some instruments measure job satisfaction (Sexton, Thomas, & Helmreich, 2000) and some have a greater focus on leadership or teamwork (Singer et al., 2003). The Safety Attitudes Questionnaire is the only one to date with limited data on the relationship of patient safety culture and outcomes (Sexton et al., 2006) and The HSOPSC and NHSPSC are the only two which focus on patient handoffs (Castle, et al., 2011b). While we assert that the NHSPSC is superior for examining patient safety culture in nursing homes, we suggest that there does need to be some standardization among the dimensions of patient safety culture. This would allow for development of a theoretical model for research further examining patient safety culture. In addition, future studies should examine how these specific subscales may be used in clinical practice.

Residents and their families desire improvements in the safety of care provided in nursing homes. Although the current dissertation has its limitations, the findings do offer greater insight into the factors predicting patient safety in nursing homes. Most importantly, the findings may contribute to improvements in the care and well-being of older adults.

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## Appendix A:

## Domains and NHSPSC Questions

| Domains and NHSPSC Questions |
|---|
| *Teamwork* |
| Resident safety is never sacrificed to get more work done |
| Our procedures and systems are good at preventing errors from happening |
| It is just by chance that more serious mistakes don't happen around here |
| When someone gets really busy in this nursing home, other staff help out |
| *Staffing* |
| We have enough staff to handle the workload |
| Staff have to hurry because they have too much work to do (-ve) |
| Residents' needs are met during shift changes |
| It is hard to keep residents safe here because so many staff quit their jobs (-ve) |
| *Compliance With Procedures* |
| Staff follow standard procedures to care for residents |
| Staff use shortcuts to get their work done faster (-ve) |
| To make work easier, staff often ignore procedures (-ve) |
| *Training & Skills* |
| Staff get the training they need in this nursing home |
| Staff have enough training on how to handle difficult residents |
| Staff understand the training they get in this nursing home |
| *Nonpunitive Response to Mistakes* |
| Staff are blamed when a resident is harmed (-ve) |
| Staff are afraid to report their mistakes (-ve) |
| Staff are treated fairly when they make mistakes |
| Staff feel safe reporting their mistakes |
| *Handoffs* |
| Staff are told what they need to know before taking care of a resident for the first time |
| Staff are told right away when there is a change in a resident's care plan |
| We have all the information we need when residents are transferred from the hospital |
| Staff are given all the information they need to care for residents |
| *Feedback & Communication About Incidents* |
| When staff report something that could harm a resident, someone takes care of it |
| In this nursing home, we talk about ways to keep incidents from happening again |
| Staff tell someone if they see something that might harm a resident |
| In this nursing home, we discuss ways to keep residents safe from harm |
| *Communication Openness* |
| Staff ideas and suggestions are valued in this nursing home. |
| Staff opinions are ignored in this nursing home (-ve) |
| It is easy for staff to speak up about problems in this nursing home |
| *Supervisor Expectations & Actions Promoting Resident Safety* |
| My supervisor listens to staff ideas and suggestions about resident safety |
| My supervisor says a good word to staff who follow the right procedures |
| My supervisor pays attention to resident safety problems in this nursing home |
| *Overall Perceptions of Resident Safety* |
| Residents are well cared for in this nursing home |
| This nursing home does a good job keeping residents safe |
| This nursing home is a safe place for residents |
| *Management Support for Resident Safety* |
| Management asks staff how the nursing home can improve resident safety |
| Management listens to staff ideas and suggestions to improve resident safety |
| Management often walks around the nursing home to check on resident care |
| *Organizational Learning* |
| This nursing home lets the same mistakes happen again and again (-ve) |
| It is easy to make changes to improve resident safety in this nursing home |
| This nursing home is always doing things to improve resident safety |

Note: (-ve) = a negatively worded item was reverse coded to calculate percent positive response

## About the Author

Kali Thomas received her Bachelor's of Arts degree in Human Development from Eckerd College in May 2006 and her Master's in Gerontology from the University of South Florida in December 2007. She entered the Ph.D. in Aging Studies program in August 2007 with an interest in quality of nursing home care and long-term care policy.

While in the Ph.D. program, Ms. Thomas was employed as a Graduate Research Assistant in the School of Aging Studies on a grant funded by the National Institute on Aging (R01AG030619, Project Title: *SAFE HAVEN: Decision Support for Nursing Home Resident Disaster Evacuations*, P.I. Vincent Mor, PhD). In addition, she was employed as a Graduate Teaching Assistant in the School of Aging Studies where she taught the undergraduate course Introduction to Gerontology. Ms. Thomas received funding from the Agency for Healthcare Research and Quality to conduct her dissertation research (R36HS19671-01, Project Title: *Understanding Processes of Care and Patient Safety Outcomes in Nursing Homes: An Examination of Patient Safety Culture*). Ms. Thomas has three first authored and nine co-authored peer-reviewed publications and has presented her research at multiple national conferences. Upon graduation with her doctorate, she will begin a post-doctoral research fellowship at the Center for Gerontology and Healthcare Research at Brown University.