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# Evaluating Patient Outcomes When Adding Licensed Practical Nurses to the Staffing Mix

Isabel C.M. Shephard, DNP, MSN, RN  
*George Washington University*

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Evaluating Patient Outcomes When Adding Licensed Practical Nurses to the Staffing Mix

Presented to the Faculty of the School of Nursing

The George Washington University

In partial fulfillment of the  
requirements for the degree of  
Doctor of Nursing Practice

Isabel C. M. Shephard, MSN, RN

DNP Project Team

Jean Johnson, PhD, RN, FAAN

Jacqueline A. Payne-Borden, PhD, RN, PMHCNS-BC

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### **Abstract**

*Background:* An incorporation of licensed practical nurses (LPNs) in the RN staffing mix was made in a small community hospital. Research shows that RNs at the bedside equates to less adverse patient outcomes such as falls, pressure ulcers and an increase on the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey.

*Objectives:* To evaluate the effects of incorporating LPNs in the staffing mix on the number of patient falls, pressure ulcers and HCAHPS survey results.

*Methods:* A Pre and Post study design was used to compare baseline data obtained four months prior to implementing and four months during the implementation of LPNs into the staffing mix on falls, pressure ulcers and HCAHPS results.

*Results:* The relationship between nursing staff skill mix and the frequency of patient falls were significant,  $X^2(1, N=1339) = 5.176, p = 0.023$ . There was no relationship between the nursing staff skill mix and pressure ulcer development. The staff skill mix was independent from patient's opinion in each of the four survey questions. The overall staff to patient mean ratio was slightly higher for the RN and LPN skill mix ( $M = 6.77, SD = 0.217$ ) than for the RN-only staff ( $M = 6.2, SD = 0.255$ ). A Z-test for two sample means revealed a statistically significant difference between the staffing skill mix during the months with the staffing changes ( $p = 0.001$ )

*Conclusions:* The findings of this research project support a nursing skill mix that is predominantly RNs for the acute care setting.

## Evaluating Patient Outcomes When Adding Licensed Practical Nurses to the Staffing Mix

### **Background**

Many hospitals are aware of the adverse outcomes that happen with decreased registered nurse (RN) presence at the bedside. The American Nurses Association (ANA) found that 54 percent of registered nurses in adult medical and emergency units report spending insufficient time with patients...due to short staffing” (Safe Nurse Staffing Looking Beyond the Numbers, 2009, p. 2). As Landro (2014) has noted through research “the more time registered nurses spend at the bedside, the less likely patients are to suffer falls, infections and medication errors, and the more likely they will be satisfied with their care” (p.1). When a hospital is short of RN staff, finding a means of caring for patients is a priority. Hiring Licensed Practical Nurses (LPNs) to substitute for RNs when an RN may not be available becomes an option to assist with caring for patients. However, this substitution may or may not have an impact on quality of patient care.

Although the RN and LPN are different in terms of education and scope of practice, some states consider the RN and LPN to give equal care to their patients (Blegen, Vaughn & Vojir, 2008). It was noted that some “hospitals are using more LPNs when RN supply is low” (Blegen, Vaughn & Vojir, 2008, p.154). These findings fuel the move to substitute LPNs for RNs such as in North Carolina which addressed the licensed nursing shortage by increasing use of LPNs as RNs were difficult to recruit.

It is imperative to evaluate the substitution of LPNs for RNs on patient care outcomes. The outcomes that are pertinent for review in this research project are falls, pressure ulcers and patient satisfaction. The LPN and RN staff mix was reviewed against the patient outcomes. The majority of evidence has shown that more RNs in the staffing mix have better patient outcomes

than substituting LPNs when examining falls, pressure ulcers and patient satisfaction. However, some research also supports positive patient outcomes when adding LPNs into the staffing mix. Although Lafer & Moss (2007) “find value in adding the LPN in the staffing mix because of their skill set, experience, and lower salaries”, evaluating the quality outcomes of substituting LPN for RN time at the bedside is needed (p.8). The results of this project will assist with future decisions for substituting LPNs for RNs in the staffing mix when evaluating the select patient outcomes.

This research project assessed fall rates, pressure ulcer rates and select questions of the Hospital Consumer Assessment of Healthcare Providers and Systems Survey (HCAHPS) to determine if these quality measures affected an RN only skill mix and an RN and LPN skill mix. By assessing fall rates and pressure ulcer rates by an RN only or RN and LPN skill mix it would distinguish what skill mixes gave the best patient outcomes. The patient satisfaction survey also showed the patients’ perception of care utilizing the RN only and the RN and LPN skill mix.

### **Problem Statement**

A small community hospital incorporated LPNs to their staffing mix on a 33 bed acute care unit due to difficulty recruiting RNs in a very competitive market. However, the leadership of the hospital was concerned about the effect of adding LPNs rather than having an all RN staff. This project is intended to provide information about the effect of adding LPNs to the nursing staff on patient outcomes. Will an RN plus LPN staff change patient outcomes?

### **Purpose**

The purpose of this study was to evaluate the effects of incorporating LPNs in the staffing mix of an acute care unit in a community hospital. The outcomes that were assessed were: fall rates, pressure ulcer rates, and patient satisfaction scores on the HCAHPS survey.

### **Specific Aims**

1. Compared fall and pressure ulcer rates pre and post implementation of LPNs into staffing mix.
2. Compared the scores of the 4 nurse communication measures in HCAHPS survey pre and post implementation of LPNs into the staffing mix.

### **Research Question**

Does substituting LPNs for RNs in the staffing mix change the number of pressure ulcers, falls and patient satisfaction scores on the HCAHPS survey?

### **Significance**

It is imperative to become creative in addressing nurse staffing in a time of shortage and concerns about cost while maintaining quality of nursing care. There is an increasing demand to avoid adverse patient outcomes. In efforts to assist with bringing nurses to bedside and increasing their direct time in patient care, the Transforming Care at the Bedside (TCAB) initiative which was nurse-led, focused on creating a more patient-centered, efficient and safe care environment (Brown, 2011). New practice approaches evolved to make TCAB a recognized approach to utilizing LPNs and allow the LPN to practice at the top of their license. The focus of TCAB was to delve into the nurses daily roles, responsibilities and routines, and see what tasks can be redirected to other less skilled professionals. It was found that “nurses are spending two-and-a- half hours to three hours on direct patient care” (Adamopoulos, 2014, para. 2). Adding LPNs to the skill mix was a way to allow RNs more time in direct patient care. It was noted that “Nurses are continuously working on tasks that are not at the top of their license” (Adamopoulos, 2014, para. 2).

Adding LPNs into the skill-mix is thought to allow the RNs to practice at the top of their license as well as allow LPNs to practice at the top of their license. Health systems have shown that RNs working within a care team allow other providers to take over many of the activities that were keeping nurses away from the bedside.

This research project examined the effects of adding LPNs into the RN team in an effort to improve nurse sensitive indicators. Given the substitution of LPNs for RNs with no additional licensed nurse time, there was a question about effect on quality of care. LPNs may help improve care by having each provider practice to the full extent of their license. However, reducing RN time may compromise quality of care. RNs may have more opportunities to teach and discuss complex medical issues with patients and coordinate their care more efficiently when they are not occupied with tasks that can be redistributed to LPNs in the skill mix.

### **Literature Review**

For this literature review SCOPUS and CINAHL were searched between 1990-2017. The key search terms and phrases included: “RNs less time in direct patient care, LPN, RN time direct patient care, RN time at bedside and adverse patient outcomes, RN direct patient care, increasing provider mix, LPN provider mix into RN staffing, provider mix and patient outcomes, nurse staffing models, adverse outcomes, nurse staffing mix, and LPN nurse staffing mix adverse outcomes, quality of care, patient safety, pressure ulcers, falls and patient satisfaction. When the terms LPNs in the staffing mix, adding time at the bedside, and skill mix with possible adverse patient outcomes were added to the Boolean operator it resulted in articles which were relevant and selected for this review.

The purpose of this literature review was to evaluate whether or not a change in the nurse staffing mix by adding LPNs changed the quality of care provided on the unit. Hospitals have

struggled to meet both quality and outcome measures as well as contain costs. Adding LPNs to the nurse staffing mix may be considered by some to be a cost containment approach without compromising nursing quality indicators. The themes in this literature review covered staffing issues on amount of time in direct patient care and the impact of the RN and LPN skill mix on patient outcomes.

### **Staffing Issues and Time in Direct Patient Care**

A major concern about the sufficiency of licensed nurse staffing is what mix of licensed nursing staff provides the best outcomes. Some researchers believe LPNs are equipped to “function like an RN with the exception of completing complex and advanced assessments, medications, and supervising” (Unruh, 2003a, p. 143). Unruh (2003b) also noted that many of the “LPNs function and provide basic care and skillsets that RNs can provide”, p.202).

There is evidence that nurses are reporting spending less time in direct patient care. Needleman noted in 2002 that, “the safety and quality of inpatient care is deteriorating” especially to “increasingly ill patients” (p. 1715). One study noted that based on “approximately thirty observed frequencies and time per nursing activities it was concluded that some nursing activities can be reallocated so that the RN can spend more time with patients” (Cornell et al., 2010, p. 373). Cornell et al. (2010) also notes “higher demanding nursing activities require concentration focus and control over interruptions” (p.373). The interruptions create less time in direct patient care which results in the patient’s perception of lacking responsiveness to their needs, safety and quality measures declining. With a staffing skill mix of RNs and LPNs each one can provide care and practice at the top of their license creating less interruptions in care so that RNs can focus on more acute nursing tasks.

Antinaho, Kivinen, Turunen & Partanen (2015) also agree that some nursing functions can be delegated to LPNs so that more RNs can spend more time with patients engaging in important functions such as patient education and advanced assessments can be completed by the RNs.

Some consequences to having an inadequate amount of RNs at the bedside results in “less time to respond to patient’s requests, assess their pain levels, provide education” and provide close monitoring of acute patients (Martsolf et al., 2016, p. 2222). Ultimately, a “patient’s perception of missed nursing care and nurse staffing levels may be associated with reductions in a hospital’s score on selected HCAHPS measures, particularly measures that are aligned most closely with necessary nursing care that might be missed” (Martsolf et al., 2016, p. 2223). Dearmon et al. (2013) suggests that RNs spending more time at the bedside will “increase the patient’s perception of responsiveness to call lights, personal needs, and increased communication” (p.669).

Hospitals put patients at risk when there is inadequate licensed nursing care... Unruh (2003a) suggests,

“As with RN staffing, insufficient licensed staff may affect the work process, resulting in hurried, delayed, omitted, fragmented, or erroneous care. This leaves patients prone to complications and hospital-acquired infections, slower recovery, or even death caused by complications or error” (p.143).

### **RN and LPN Skill Mix on Patient Outcomes**

Many studies looked into the effects of the LPN and RN skill mix on patient outcomes such as falls and pressure ulcers. Bae et al. (2014) showed a decrease of patient falls when there

was “an hour increase in LPN hours per patient day” (p.318). Some alarming results included a higher rate of patient falls when the staff were all (temporary) RNs (Bae et al., 2014).

Blegen et al. (2008) promoted the creative use of the LPN for staffing and further research on the LPN and quality of care measures. When utilizing the LPN in their full capacity they can fill in the gaps where a RN is needed. This will allow more licensed nurses to provide direct patient care.

Patrician et al. (2017) discusses utilizing the LPN due to their skilled background in pressure ulcer prevention. Patrician’s study showed a decrease of pressure ulcers with LPN staffing. This study took place in the VA Hospital systems where the LPN is utilized more abundantly than in non-VA healthcare systems. Due to the LPN background of working in skilled nursing facilities, the bulk of the LPN job is providing wound care and turning patients to prevent pressure ulcers.

Rudisill et al. (2014) also provided different staffing models that included utilizing LPNs and noted an increase in HCHAPS scores and positive outcomes on quality measures such as hospital acquired pressure ulcers, medication errors, and near misses. With the different staffing models, the objectives were to ensure and empower the staff to function at their full capability. The RN was the team leader for the staffing model and provided further guidance to the unlicensed personnel and the LPNs. For this particular study, LPNs had more functionality on the units and were able to do advanced tasks such as giving intravenous medication and starting IV lines (Rudisill et al., 2014). With utilizing the LPNs to their maximum capacity, they worked alongside unlicensed assistive personnel (UAP) and their RN team leader to provide a comprehensive approach to care, “Minimizing the time spent on non-value adding work could increase the nurses’ time used for providing value-added care” (Antinaho et al., 2015, p. 1103).

Adverse patient events are varied and range from falls to sentinel events including death. The pioneer in nurse staffing outcomes research Aiken (1994) suggested, a higher level of nurse staffing is associated with better outcomes. Aiken et al. (2002) discusses in other research that lower patient to nurse ratios are related to better patient outcomes. Aiken et al. (2011) conducted a study which included the effects of nurse education on patient mortality. This study suggested having more nurses with BSN degrees taking care of fewer patients is related to better patient outcomes. Cho et al. (2015) also found that “nurse education appears to affect patient outcomes” (p.536). Historically, Aiken (1994) did not differentiate between RN and LPN, she hypothesized more licensed staff would be related to better outcomes.

Unruh (2003a) supported including LPN staffing in the skill mix as LPNs can function to the capacity of RNs with the exception of “engaging in more complex clinical judgments and supervising licensed personnel” (p.143). With that exception, the LPN can potentially fill in the gaps where RNs skills are not essential to providing high quality of care. Less adverse patient outcomes were noted when there were more licensed personnel to provide patient care. However, Unruh (2003a) found that a higher proportion of licensed nurses was significantly related to a greater number of patient falls. The majority of the research indicated there is an increase in adverse events with a lack of licensed nurses which include RNs and LPNs at the bedside. Prior research did not fully clarify if RNs or LPNs contributed to adverse patient outcomes until the research of Aiken (1994). Researchers began to report that the lack of RNs at the bedside contributed to adverse patient events as well as adding LPNs to the bedside in place of RNs increased adverse events (Aiken, 1994, Aiken et al., 2011). Aiken’s research is supported by the study done by Kane et al. (2007) which found a decrease in falls and pressure ulcers when the facility staffed with all BSN prepared nurses. Other studies have shown that:

“higher proportion of nursing care provided by LPNs is associated with increased rates of mortality and sepsis suggesting that substitution of LPNs for RNs may be the mechanism leading to worse outcomes in hospitals with higher levels of LPN staffing” (Glance et al., 2012, p. 5).

Another point of view was taken by Kalisch et al. (2012) is that they do not identify the staffing skill mix to be the reason behind adverse patient events. They found that “further work must be done to assist nurses in completing necessary tasks such as ambulation, toilet assistance, patient assessments, and call light responses, which may or may not mean additional staff members” (p.11). In essence Kalisch et al. (2012) felt that if a hospital is appropriately staffed whether or not you have a mixed staff of RNs and LPNs, falls may still occur due to the nursing processes not being completed. Schreuders et al. (2014) found even with different skill mixes “improved staffing levels tended to be associated with increased odds of pressure ulcer, pneumonia and ...” (p.806). Staggs, Knight and Dunton (2012) found that patient falls were not only linked to the “nursing care hours provided...but also the qualifications and experience of the personnel providing these hours” (p. 198). These mixed outcomes make it difficult to make staffing decisions due to the outcomes of the studies.

### **Theoretical Foundation**

An important aspect of the endeavor to create change in the staffing mix of the unit was included in this project. The change theory or a methodological approach provided a way of understanding the staffing changes which is the independent variable of this project (Shirey, 2013). With the opportunity to assess the quality of care impact associated with a change in the staffing mix Lewin’s Theory of Planned Change (TPC) was selected to support this project proposal. The TPC used three steps to implement change versus other change theories which

uses multiple steps before change can take place. This project was aimed at understanding the outcome of adding licensed practical nurses to a staffing mix on nurse sensitive quality indicators. After different theories of change were reviewed, the TPC model was selected. The TPC utilized three stages Unfreezing, Moving and Refreezing (Lewin, 1947; Shirey, 2013; Lewins Change Theory, 2017). A look into each stage and the supporting evidence from the data was included.

The Unfreezing stage is the first step which looked into the driving forces for change (Theories at a glance). The reasons for substituting LPNs for RNs were due to the urgent need to address the challenge of recruiting a sufficient number of RN staff. The new staffing model was reviewed by the RNs on the unit who agreed to hire LPNs into the nurse staffing to assist with the shortage. The evaluation included supporting evidence from practice indicating RNs were not able to provide direct patient care and were losing time with patients at the bedside suggesting that RNs might be engaged in functions that LPNs could manage and give the RNs more client time. The urgent need for change allowed the chief nursing officer to create a solution on how to solve the problem (Shirey, 2013). The chief nursing officer had to unfreeze the willingness to integrate a new skill mix model to include the LPNs into staffing.

The Moving stage was the next step, in the TPC. This step included developing a plan on how to potentially solve the problems and prepare for the next steps in the change process (Shirey, 2013). In this stage, LPNs were integrated into the acute care setting after the LPNs were interviewed and hired.

The last step was Refreezing in the TPC. “The refreezing stage established the change as the new habit, so that it would become the “standard operating procedure” (Lewin’s Change Theory, 2017). The refreezing stage supported incorporating the change into practice. In this

stage the LPNs were integrated into the skill mix. This stage was also fundamental to the research project's evaluation of outcomes and results. In this final stage of the research project the evaluation of all outcomes proposed was completed.

In conjunction with the 3 phases of the TPC, Lewin discusses two forces that drive change and resist change. If there is balance between the two forces, then change does not occur. According to Lewin (1947), the driving force must exceed the resisting force. Prior to the research project the culture of the hospital did not support LPNs into the staffing mix. There were thoughts by the researcher that a resistive force could dominate the driving force for change. Staff was resisting the LPNs due to their education and skillset and in general the trend in nursing has been to eliminate LPNs in an acute care setting.

The driving force for change was the CNO who obtained buy in from stakeholders who were influential and receptive to driving change. Evidence-based research was presented to staff to support the needed change of incorporating LPNs into staff mix. Due to this imbalance where the drivers of change exceeded the resisters of change the research project came to fruition and LPNs were recruited and hired for the medical/surgical unit.

### **Identifying and Defining Variables**

The variables for the research project are described in Appendix A and include the dependent and independent variables. The theoretical and operational definitions are also included and defined.

## **Methods**

### **Research Design**

The design for this research project was a quantitative research approach. A pre and post HCAHPS survey results were examined for changes to the variables prior to implementation of

LPNs into the staffing mix and four months after implementation of the new staffing mix. The study also utilized electronic data to obtain patient falls and pressure ulcers rates pre and post implementation of staffing change.

Baseline data obtained 4 months prior to the implementation of the study was assessed. The data also assessed monthly reported fall rates and pressure ulcers as well as the patient satisfaction (through HCHAPS survey) scores. In addition, the RN to patient ratio, the LPN to patient ratio and the RN plus LPN to patient ratio was calculated. Data collected prior to the integration of the LPNs was compared to the data collected during 4 months of LPNs being part of the nursing skill mix. Comparing the HCAHPS scores and analyzing the fall and pressure ulcer rates enabled the researcher to answer the question: Does adding LPNs to the nursing staff change the number of pressure sores, falls and patient satisfaction scores on the HCAHPS?

### **Sample/Participants**

The sample for the study included the entire population on the unit including the staff skill mix and patients. The nurses were either a LPN or RN. The nursing degrees for the RNs were not analyzed for this research project. Data related to nurse staffing came from the daily staffing log which included RNs and LPNs. The pre implementation data was collected prior to the LPNs going into staffing. The post implementation data occurred when the LPNs were added to the staffing mix. The patient sample included patients admitted into the medical/surgical unit.

### **Setting**

The data was collected from the 33-bed inpatient medical/surgical unit at a small acute care hospital in the mid-Atlantic region. This unit was the only unit adding LPNs into the staffing mix. The data from the study was collected from November 1, 2016-June 30<sup>th</sup>, 2017.

**Inclusion**

- All LPNs and RNs on the unit
- All patient outcomes reported for falls, and pressure ulcers both prior to and post incorporating LPNs to the staff mix
- HCAHPS patient survey results related to the four communication questions

**Exclusion**

- Any fall or pressure ulcer that occurred prior to admission to the unit

**Measurements**

For this research project the dependent variables/outcomes that were measured were; falls, pressure ulcers, and select HCAHPS questions regarding nurse communication. The falls assessment instrument used by the facility is in Appendix B. The pressure ulcer assessment used by the facility is in Appendix C. The independent variables of provider mix were also reviewed. The measurement tool for falls and pressure ulcer outcomes assessed was the National Database of Nursing Quality Indicators (NDNQI) which standardized measures used across the country to assess these two data points. The quality improvement coordinator used these tools when evaluating the falls and pressure ulcer outcomes.

The fall rates and pressure ulcer rates were provided in the form of aggregated data from the quality improvement coordinator. The data was collected from November 2016-June 2017. The 4 months prior to the start of the data collection was retrieved as baseline data and was compared with the final results. The pre implementation fall rates was included and compared with the post implementation fall rates after they were collected and included in the data collection table.

The HCAHPS questions were measured using the data collected and reported to the hospital of the surveys that were completed. The HCAHPS questions included in this research project were four questions regarding nurse communication. The survey uses a 4-point scale, 1-never, 2-sometimes, 3-usually and 4-always, for each question asked. For this project, the aggregated scores were also obtained for each question. The survey is random and anonymous so the hospital did not know when the surveys were administered. Westbrook, Babakus & Grant (2014) state, “there is limited validation of HCAHPS since its widespread implementation”. Westbrook et al. (2014) also felt that the HCAHPS survey was very subjective, and that some questions were valid when evaluating their “functional quality versus their technical quality” as cited by Gonroos (1984). The functional qualities of some survey questions are subjective and expressed as the service that was given to a patient and evaluated by their compassion, communication and interactions (Westbrook et al., 2016). The Agency for Healthcare Research and Quality (AHRQ) and The Centers for Medicare & Medicaid Services (CMS) did a study, “HCAHPS Three-State Pilot Study”, which includes the analysis and results for the HCAHPS survey questions and their internal consistency and reliability (HCAHPS Three-State, 2003). After multiple testing of questions used for the HCAHPS survey using Cronbach’s alpha, each question for this study has a result to determine the reliability. HCAHPS Questions 1: *During this hospital stay, how often did nurses treat you with courtesy and respect?* (0.76); HCAHPS 2: *During this hospital stay, how often did nurses listen carefully to you?* (0.72); 3: *During this hospital stay, how often did nurses explain things in a way you could understand?* (0.71) and 4: *During this hospital stay, after you pressed the call button, how often did you get help as soon as you wanted it?* (0.57). For this research project the functional questions from the HCAHPS were

accepted as valid and reliable due to the nature of the questions being subjective, and it did not require information from patients to decide if they were receiving amicable interactions.

The reliability and validity of each tool used for the aggregated data was assessed through a variety of research over the past two decades. It appears the reliability and validity of the falls data point was high due to the standard measurements used for falls. There was a 95% CI in one study when comparing the reliability and validity of the scales measure and the patients were assessed identical for falls. The reliability of the pressure ulcer rate was high when looking at the incidence of pressure ulcer development. It was also found that the inter rater reliability (IRR) scale was high using the Cohen's [kappa] statistic was 0.97 and 0.81 in the hospitals for pressure ulcer staging (Hart, 2006). Waugh & Berquist-Beringer (2017) assessed the pressure ulcer risk and prevention questions for each patient and observed the documentation.

“Data on the reliability and validity of pressure ulcer diagnosis and grading are inconsistent. Some studies demonstrated that pressure ulcer diagnosis is unreliable, whereas others calculated 100% agreement. Some studies found fair to moderate results for pressure ulcer grading, others substantial or almost perfect agreement” (Stausberg, 2007).

### **Data Collection**

All falls and pressure ulcer data were aggregated data that were reported to CMS. The HCAHPS scores were obtained through an outside vendor NCR Picker which reported results to the hospital's quality improvement coordinator. The aggregated data were given to the student investigator and were put into an excel spreadsheet. The student investigator also reviewed the previous collected daily census with the staff skill mix for each twenty four hour period for the data collection period of November 1, 2016-June 30<sup>th</sup>, 2017. Data did not include any PHI.

### **Data Collection Procedure**

All study data collected were aggregated and did not contain any patient information. The first step was to collect all the pre implementation of LPNs into the skill mix data including fall rates, pressure ulcer rates and HCAHPS scores.

The second step was to collect all post implementation of LPNs into the staffing mix data which included fall rates, pressure ulcer rates and HCAHPS scores. All data was kept until the Primary Investigator reviewed and approved the research findings and analyzed the research project data.

The fall and pressure ulcer data for both pre and post implementation of LPNs into the staffing mix was aggregated data that was collected by the hospital's quality improvement coordinator. The HCAHPS scores were aggregated data provided by the quality improvement coordinator. The HCAHPS scores were collected through an outside vendor NCR Picker which provided daily updates regarding the total amount of patients surveyed. The scores were calculated monthly and the hospital had access to monthly and quarterly reports. The HCAHPS scores were collected before and after the LPNs are added into the staffing mix. The scores included a percentage score and the number of respondents for each question.

### **Timeline**

The research project was completed in 3 stages (Appendix D). Phase 1 included the IRB approval along with other IRB documents that were approved of the DNP Research Project. The pre-implementation of LPNs into staffing mix data was collected and entered into a secured personal computer drive after collection of data. Stage 2 consisted of collecting the 4 months of data post implementation of the LPN into staffing. Stage 3 included the finalization of the data entry and data analysis, revision and the review of the final DNP Research Project and the final

first draft of the completed DNP Research Project which was sent to the Primary and Secondary Advisors.

### **Data Analysis**

There were 2 aims of the study:

1. Compare fall and pressure ulcer rates pre and post implementation of LPNs into staffing mix.
2. Compare the scores of the 4 nurse communication measures in HCHAPS survey pre and post implementation of LPNs into the staffing mix.

SPSS 24 and excel was used to analyze data. Descriptive statistics was used to analyze the provider mix before and after the implementation of staffing change data. An independent Z-test was completed to answer the question: Is there a difference in total nurse to patient ratio before and after the implementation of staffing change.

To compare the fall and pressure ulcer rates before and after implementation, the Pearson's Chi-Square test was used. First, total number of patients with a fall during the four months, pre-implementation was calculated. Second, the total number of patients with falls for four months, in the post-implementation period was calculated. These numbers were used to perform the chi-square test. The analysis method was also used for pressure ulcers however no pressure ulcers were reported throughout the research project. For all analyses, alpha was set to 0.05. The HCAHPS scores before and after adding the LPNs into staffing were analyzed obtained using a Chi-Square test. For all analyses, alpha was set to 0.05.

### **Ethical Considerations**

Prior to collection of all patient data the Collaborative Institutional Training Initiative (CITI) and Health Information Privacy and Security (HIPS) courses were completed to ensure

understanding of protection of human subjects in research and also maintaining privacy of human subjects in research. For this DNP Research Project, there was no human subjects experimentation. With the authorization of the data collection site, data collection will not use sensitive, personally identifiable information. Information obtained for falls and pressure ulcers was aggregated data which included a rate of incidence and the HCAHPS survey results was provided by the hospital's outside vendor.

### **Results**

Descriptive statistics was used to estimate the patient ratios to the RN only and the RN and LPN staffing skill mix. The four observation months included pre and post implementation of staffing changes (Table 3). Figure 1 illustrates the patient ratios for each nursing staff skill mix across the four pre and post observation months. The overall patient to staff mean ratio was slightly higher for the RN and LPN skill mix ( $M = 6.77$ ,  $SD = 0.217$ ) than for the RN-only staff ( $M = 6.2$ ,  $SD = 0.255$ ). A Z-test for the two sample means revealed a statistically significant difference between the mean ratio for patients to RN skill mix and the mean ratio for the patient to RN and LPN skill mix during the months with the staffing changes ( $p = 0.001$ ).

A Pearson's Chi-Square test for independence was used to examine the association between patients' fall rates and the nursing staff skill mix using RNs only and using a combination of RNs and LPNs (Table 4). The relationship between nursing staff skill mix and the frequency of patient falls was significant,  $X^2(1, N=1339) = 5.176$ ,  $p = 0.023$ .

A Chi-Square test of independence was also used to investigate the relationship between nursing staff skill mix and patient level of satisfaction as measured by four selected HCAHPS questions. The relationship between the variables was found to be insignificant. The staff skill mix was independent from the patient's response in each of the four survey questions selected

for this research project (Table 5). HCAHPS question 1: *During this hospital stay, how often did nurses treat you with courtesy and respect*,  $X^2(1, N = 178) = 0.056, p = 0.81$ ). HCAHPS question 2: *During this hospital stay, how often did nurses listen carefully to you*,  $X^2(1, N = 190) = 0.196, p = 0.66$ ) HCAHPS question 3: *During this hospital stay, how often did nurses explain things in a way you could understand*,  $X^2(1, N = 179, p = 0.048), p = 0.83$ ). HCAHPS question 4: *During this hospital stay, after you pressed the call button, how often did you get help as soon as you wanted it*,  $X^2(1, N = 147) = 1.001, p = 0.32$ ).

### Discussion

The average patient to RN ratio was 6.2: 1 for the four months prior to the staffing change. This finding was statistically different from the post implementation patient to LPN and RN staff ratio of 6.77:1. The four months prior to adding the LPNs into the skill mix there was a total of 746 patients admitted and only 7 patients sustained falls. The four months that the LPNs were added into the skill mix, there were 593 patients admitted and 15 patients' sustained falls. This finding could have affected the increase in falls that occurred during the post-implementation of LPNs time frame. Having fewer nurses, especially RNs, has been related to an increase number of falls. This finding is consistent with the work of Aiken, Cho and others. In the studies with Aiken (1994) it suggested that a higher level of nurse staffing is associated with better outcomes". In another research by Aiken et al. (2002), it discussed that lower patient to nurse ratios are related to better patient outcomes. Cho et al. (2015) also found that "nurse education appears to affect patient outcomes" (p.536). As noted through the research, lower patient to nurse ratio and RNs only in staffing results in better patient outcomes (Aiken et al., 2002 and Cho et al., 2015). Other researchers such as Staggs, Knight and Dunton (2012) support that patient falls and other adverse patient outcomes can be prevented with a RN only staff.

Even with a higher patient to nurse ratio in the post-implementation phase, there were no reports of pressure ulcer development. This represented no change from the pre-implementation phase in which no pressure ulcers were reported. Pressure ulcer prevention could be related more to factors other than staffing such as a focused effort was being made on pressure sore prevention by the institution, the patient population is not a high-risk population for pressure sores, or there was certified nursing assistants (CNA) that managed the activities related to pressure ulcer prevention. CNAs were not included in the staff mix analysis. Further study could reveal a breaking point in terms of the patient to staff mix where pressure ulcer development would occur.

There was no statistically significant difference in the four HCAHPS survey questions scores before or after the integration of LPNs into the staffing mix. It is not clear why there is no difference in the HCAHPS scores. However, there are variables such as staff organization, nurses' communication pattern, patient-centered care approach and leadership involvement which could have impacted survey responses. In addition, there also could be effective CNA staff that supports the licensed staff contributing to the patient experience. Further research would need to take into consideration these potential explanations.

### **Study Limitations**

The HCAHPS questionnaire was a random survey which does not capture 100% of patients and was not a real time survey. The survey was sent after the patient left the hospital and being home might and a lapse in time may influence perception. In addition, the study design being a non-experimental may have created a limitation. As noted through other research, "due to the non-experimental study design, a causal relationship between the staffing mix and the patient falls cannot be inferred" (Schreuders et al., 2015, p. 809).

The generalizability of this research project is another limitation due to the research occurring only at one hospital and one unit of the hospital. Other hospitals may have a more robust on boarding for their LPNs or a different set of job responsibilities which can impact the research findings. Collecting data on the LPNs onboarding was not a part of this project; therefore information on how they were oriented, what their set of responsibilities were, and how they were deployed are unknown. Also, the staffing mix of RNs only and RNs and LPNs that would produce better outcomes to decrease falls and increase HCAHPS survey results is not known in this research project. Lastly, this study did not take into account the contribution of CNAs to the care of patients.

### **Recommendations for Practice**

This research project supported previously reported research that there are better patient outcomes with a RN only staff mix when observing patient falls data. It also suggests that job responsibilities need to be more fully understood in how RNs and LPNs work together. The research project also considered reviewing the patient ratio to the staffing skill mix on adverse patient outcomes can be beneficial to making assignments. This would help to determine if lower patient to nurse ratios and skill mixes have an effect on adverse patient outcomes. Further exploration into optimal patient ratios to the staffing skill mix and other factors such as the use of CNAs and how the nursing workforce is deployed to reduce patient falls will also assist to ensuring adverse outcomes are prevented.

Other recommendations for practice can be to conduct further research of the staffing skill mix on other adverse patient outcomes. It would also be beneficial to consider nursing years of experience and education levels when evaluating the nursing skill mix.

### **Conclusion**

The research project adds further data regarding the impact of incorporating LPNs for RNs in the staffing mix on patient outcomes. The RNs only and the LPNs and RNs in the staffing mix did not impact the patient satisfaction scores on the HCAHPS survey or pressure ulcer development. The findings of this research project support a nursing skill mix that is predominantly RNs for the acute care setting to reduce the incidence of patients' falls. However, skill mix will continue to be an area of importance to more fully understand as challenges of recruiting RNs remain as well as cost reduction pressures influence the licensed nurse skill mix in acute care.

## References

- Adamopoulos, H. (2014). Bringing Nurses Back to the Bedside: How Novant Health Tripled Direct Patient Care Time. *Beckershospitalreview.com*. Retrieved 27 April 2017, from <http://www.beckershospitalreview.com/quality/bringing-nurses-back-to-the-bedside-how-novant-health-tripled-direct-patient-care-time.html>
- Aiken, L. H. (1994). *Medical care: Lower medicare mortality among a set of hospitals known for good nursing care* Lippincott Williams and Wilkins.
- Aiken, L., Cimiotti, J., Sloane, D., Smith, H., Flynn, L., & Neff, D. (2011). Effects of Nurse Staffing and Nurse Education on Patient Deaths in Hospitals With Different Nurse Work Environments. *Medical Care*, 49(12), 1047-1053. Retrieved from <http://www.jstor.org.proxygw.wrlc.org/stable/23053849>
- Aiken, L.H, Clarke, S.P., Sloane, D.M., Sochalski, J., Silber, J. H. (2002) Hospital Nurse Staffing and Patient Mortality, Nurse Burnout, and Job Dissatisfaction. *JAMA*. 2002; 288(16):1987-1993. doi:10.1001/jama.288.16.1987
- Antinaho, T., Kivinen, T., Turunen, H., & Partanen, P. (2015). Nurses' working time use - how value adding it is? *Journal of Nursing Management*, 23(8), 1094-1105. doi:10.1111/jonm.12258
- Bae, S. -, Kelly, M., Brewer, C. S., & Spencer, A. (2014). Analysis of nurse staffing and patient outcomes using comprehensive nurse staffing characteristics in acute care nursing units. *Journal of Nursing Care Quality*, 29(4), 318-326. doi:10.1097/NCQ.0000000000000057
- Bergquist-Beringer, S., Davidson, J., & Cuddigan, J. (2017). NDNQI® | Pressure Injury Training v. 5.0 | Module III. *Members.nursingquality.org*. Retrieved 26 July 2017, from

[https://members.nursingquality.org/ndnqipressureulcertraining/Module3/PressureULcerSurveyGuide\\_20.aspx](https://members.nursingquality.org/ndnqipressureulcertraining/Module3/PressureULcerSurveyGuide_20.aspx)

- Blegen, M. A., Vaughn, T., & Vojir, C. P. (2008). Nurse staffing levels: impact of organizational characteristics and registered nurse supply. *Health Services Research, 43*(1 Pt 1), 154-173. doi:10.1111/j.1475-6773.2007.00749.x
- Brown, M. (2011). *Transforming Care at the Bedside*. RWJF. Retrieved 27 April 2017, from <http://www.rwjf.org/en/library/research/2011/07/transforming-care-at-the-bedside.html>
- Cho, E., Sloane, D. M., Kim, E., Kim, S., Choi, M., Yoo, I. Y., & ... Aiken, L. H. (2015). Effects of nurse staffing, work environments, and education on patient mortality: An observational study. *International Journal Of Nursing Studies, 52*(2), 535-542. doi:10.1016/j.ijnurstu.2014.08.006
- Cornell, P., Herrin-Griffith, D., Keim, C., Petschonek, S., Sanders, A. M., D'Mello, S., . . . Shepherd, G. (2010). Transforming nursing workflow, part 1: The chaotic nature of nurse activities. *Journal of Nursing Administration, 40*(9), 366-373. doi:10.1097/NNA.0b013e3181ee4261
- Dearmon, V., Roussel, L., Buckner, E. B., Mulekar, M., Pomrenke, B., Salas, S., . . . Brown, A. (2013). Transforming care at the bedside (TCAB): Enhancing direct care and value-added care. *Journal of Nursing Management, 21*(4), 668-678. doi:10.1111/j.1365-2834.2012.01412.x
- Garrard, L. (01/2016). *Western journal of nursing research: Reliability and validity of the NDNQI® injury falls measure* Sage Publications. doi:10.1177/0193945914542851

- Gearing, R. E., Mian, I. A., Barber, J., & Ickowicz, A. (2006). A Methodology for Conducting Retrospective Chart Review Research in Child and Adolescent Psychiatry. *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, 15(3), 126–134.
- Glance, L. G., Dick, A. W., Osler, T. M., Mukamel, D. B., Li, Y., & Stone, P. W. (2012). The association between nurse staffing and hospital outcomes in injured patients. *BMC Health Services Research*, 12(1) doi:10.1186/1472-6963-12-247
- Hart, S. (07/2006). *Journal of nursing care quality: Reliability testing of the national database of nursing quality indicators pressure ulcer indicator* Lippincott Williams and Wilkins.
- HCAHPS Three-State Pilot Study Analysis Results. (2003). [ebook] Rockville. Available at: [https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Downloads/Hospital3State\\_Pilot\\_Analysis\\_Final200512.pdf](https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Downloads/Hospital3State_Pilot_Analysis_Final200512.pdf)
- Kalisch, B. J. (2012). *Journal of nursing care quality: Missed nursing care, staffing, and patient falls* Lippincott Williams and Wilkins. doi:10.1097/NCQ.0b013e318225aa23
- Kane, R. L., Shamliyan, T. A., Mueller, C., Duval, S., & Wilt, T. J. (2007). The association of registered nurse staffing levels and patient outcomes: systematic review and meta-analysis. *Medical Care*, 45(12), 1195-1204.
- Lafer, G. & Moss, H. (2007). *The LPN: A Practical Way to Alleviate the Nursing Shortage* (1st ed.). A Report Prepared for the United Nurses of America, AFSCME, AFL-CIO. Retrieved from <http://m.afscme.org/news/publications/health-care/body/The-LPN-2007>
- Lampert, L. (2016). Top 3 challenges for an LPN. *Scrubs Magazine*. Retrieved 25 January 2017, from <http://scrubsmag.com/top-3-challenges-for-an-lpn/>

- Landro, L. (2014). Nurses Shift, Aiming for More Time with Patients. WSJ. Retrieved 26 January 2017, from <https://www.wsj.com/articles/nurses-shift-aiming-for-more-time-with-patients-1405984193>
- Lewin, K. (1947). Frontiers in group dynamics: Concept, method and reality in social science; Equilibrium and social change. *Human Relations 1(1): 5–41*.
- Lewin's Change Theory - Nursing Theory*. (2017). *Nursing-theory.org*. Retrieved 21 February 2017, from <http://www.nursing-theory.org/theories-and-models/Lewin-Change-Theory.php>
- Martsof, G. R., Gibson, T. B., Benevent, R., Jiang, H. J., Stocks, C., Ehrlich, E. D., . . . Auerbach, D. I. (2016). An examination of hospital nurse staffing and patient experience with care: Differences between cross-sectional and longitudinal estimates. *Health Services Research*, doi:10.1111/1475-6773.12462
- Matt, V., & Matthew, H. (2013). The retrospective chart review: important methodological considerations. *Journal of Educational Evaluation for Health Professions*, 10, 12. <http://doi.org/10.3352/jeehp.2013.10.12>
- Montalvo, I. (2007). Retrieved 1 April 2017, from <http://www.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/Volu>
- Needleman, J., Buerhaus, P., Mattke, S., Stewart, M., & Zelevinsky, K. (2002). Nurse-staffing levels and the quality of care in hospitals. *New England Journal of Medicine*, 346(22), 1715-1722. doi:10.1056/NEJMsa012247
- Nooney, J. G., & Lacey, L. M. (2007). Validating HRSA's Nurse Supply and Demand Models: A State-Level Perspective. *Nursing Economic\$, 25(5)*, 270-278.

Patrician, P. A., McCarthy, M. S., Swiger, P., Raju, D., Breckenridge-Sproat, S., Su, X., . . .

Loan, L. A. (2017). Association of temporal variations in staffing with hospital-acquired pressure injury in military hospitals. *Research in Nursing and Health*, 40(2), 111-119. doi:10.1002/nur.21781

Rudisill, P. T., Callis, C., Hardin, S. R., Dienemann, J., & Samuelson, M. (2014). Care redesign: a higher-quality, lower-cost model for acute care. *The Journal Of Nursing Administration*, 44(7/8), 388-394. doi:10.1097/NNA.0000000000000088

Safe Staffing Looking Beyond the Raw Numbers. (2009) (1st ed.). Retrieved from [http://www.nso.com/Documents/pdfs/Newsletters/Safe\\_Nurse\\_Staffing\\_Looking\\_Beyond\\_the\\_Raw\\_Numbers\\_2009-4.pdf](http://www.nso.com/Documents/pdfs/Newsletters/Safe_Nurse_Staffing_Looking_Beyond_the_Raw_Numbers_2009-4.pdf)

Schreuders, L. W., Bremner, A. P., Geelhoed, E., & Finn, J. (2015). The relationship between nurse staffing and inpatient complications. *Journal of Advanced Nursing*, 71(4), 800-812. doi:10.1111/jan.12572

Shirey, M. (2013). The journal of nursing administration: Lewin's theory of planned change as a strategic resource J.B. Lippincott, etc.

Stausberg, J. (2007). *International journal of nursing studies: Reliability and validity of pressure ulcer diagnosis and grading: An image-based survey* Elsevier. doi:10.1016/j.ijnurstu.2006.06.006

Staggs, V. S., Knight, J. E., & Dunton, N. (2012). Understanding unassisted falls: Effects of nurse staffing level and nursing staff characteristics. *Journal of Nursing Care Quality*, 27(3), 194-199. doi:10.1097/NCQ.0b013e318241da2d

Unruh, L. (2003a). Licensed nurse staffing and adverse events in hospitals. *Medical Care*, 41(1), 142-152. doi:10.1097/00005650-200301000-00016

- Unruh, L. (2003b). The effect of LPN reductions on RN patient load. *Journal of Nursing Administration, 33*(4), 201-208. doi:10.1097/00005110-200304000-00004
- Waugh, S. M., & Bergquist-Beringer, S. (2016). Inter-rater agreement of pressure ulcer risk and prevention measures in the national database of nursing quality indicators® (NDNQI). *Research in Nursing and Health, 39*(3), 164-174. doi:10.1002/nur.21717
- Westbrook, K. W., Babakus, E., & Grant, C. C. (2014). Measuring patient-perceived hospital service quality: Validity and managerial usefulness of HCAHPS scales. *Health Marketing Quarterly, 31*(2), 97-114. doi:10.1080/07359683.2014.907114

Appendix A

Variables for the LPN into RN Staffing Mix

<b>Variable</b>	<b>Theoretical Definition</b>	<b>Operational Definition</b>
<i>Dependent Variables</i>		
<p>Patient Outcomes:                      Pressure ulcers                      Falls</p>	<p>Quality measures being monitored on a monthly basis include pressure ulcers and falls</p>	<p>1. Results of monthly quality measure reports which look into the numerator and denominators for each variable and provide a rate for each measure. Pressure ulcers- skin lesions that were not present on admission                      Numerator- number of pressure ulcers found                      Denominator- total number of hospital patients</p> <p>Falls-unplanned patient descend                      Numerator- number of patient falls                      Denominator- total number of hospital patients</p>
<p>HCAHPS Questions 1-4                      Nurse specific measures</p>	<p>These questions reflect the patient experience of care by nurses. These questions will be asked by Gallup Poll in an anonymous survey sent to select patients after discharge.</p>	<p>1. During this hospital stay, how often did nurses treat you with courtesy and respect?</p> <p>2. During this hospital stay, how often did nurses listen carefully to you?</p> <p>3. During this hospital stay, how often did nurses explain things in a way you could understand?</p> <p>4. During this hospital stay, after you pressed the call button, how often did you get help as soon as you</p>

		wanted it?
<i>Independent Variables</i>		
Provider mix: LPN to patient ratio RN to patient ratio Total RN and LPN to patient ratio	New nurse staffing model with adding LPN into skill mix. Continue to assess patient outcomes.	Review daily staffing ratios for RNs and LPNs

Appendix B

Falls Data Collection Table

	Determined Fall Yes /NO	Determined Fall Yes /NO	Determined Fall Yes /NO	Determined Fall Yes /NO
Hospital location of the fall				
Fall was witnessed, self- reported, or assisted				
Medication administered to the patient				
Any injuries observed at the time of the fall or during post- assessment				

\*National Database of Nursing Quality Indicators® (NDNQI®) Falls Assessment Tool for data collection

Appendix C

Pressure Ulcer Risk Measurement tool

<b>Pressure Ulcer Risk measures</b>	Incident # Pressure ulcer present Yes or NO	Incident# Pressure ulcer present Yes or NO
Skin assessment on admission	<i>Yes, No, Pending</i>	<i>Yes, No, Pending</i>
Risk assessment on admission	<i>Yes, No, Pending</i>	<i>Yes, No, Pending</i>
Time since last PrU risk assessment (0–12 hours, >12–24 hours, >24–48 hours, >48–72 hours, >72 hours to 1 week, >1 week)		
Pressure Ulcer Risk assessment method	<i>Braden Scale, Norton Scale, Other Scales/Clinical Factors</i>	<i>Braden Scale, Norton Scale, Other Scales/Clinical Factors</i>
Risk status	<i>Yes—based on risk assessment score, Yes—based on clinical factors, No</i>	<i>Yes—based on risk assessment score, Yes—based on clinical factors, No</i>
<b>Pressure Ulcer Prevention Measures</b>		
Any Pressure Ulcer prevention	<i>Yes, No, Pending</i>	<i>Yes, No, Pending</i>
Skin assessment documented	<i>Yes, No, Pending</i>	<i>Yes, No, Pending</i>
Pressure-redistribution surface use	<i>Yes, No, Documented contraindication, Unnecessary for the patient, and Patient refused</i>	<i>Yes, No, Documented contraindication, Unnecessary for the patient, and Patient refused</i>
Routine repositioning	<i>Yes, No, Documented contraindication, Unnecessary for the patient, and Patient refused</i>	<i>Yes, No, Documented contraindication, Unnecessary for the patient, and Patient refused</i>
Nutritional support	<i>Yes, No, Documented contraindication, Unnecessary for the patient, and Patient refused</i>	<i>Yes, No, Documented contraindication, Unnecessary for the patient, and Patient refused</i>
Moisture management, within the previous 24 hours	<i>Yes, No, Documented contraindication, Unnecessary for the patient, and Patient refused</i>	<i>Yes, No, Documented contraindication, Unnecessary for the patient, and Patient refused</i>

\*NDNQI® Pressure Ulcer Risk Measurement Tool for data collection

Appendix D

Research Project Timeline

	Months						
	10/2017	10/2017	11/2017	11/2017	12/2017	01/2018	02-03/2018
Stage 1							
IRB Approval							
Meeting with Data collectors							
Pre Implementation Data Collection							
Stage 2							
Post Implementation Data Collection							
Stage 3							
Finalize Data Entry/Analysis							
Revise and Review Final Project							
First Draft of completed DNP project to Primary and Secondary advisors							



Table 2

Aggregated HCAHPS Scores

HCAHPS Questions	Pre-implementation				Post-implementation			
	Mo.1	Mo.2	Mo.3	Mo.4	Mo.1	Mo.2	Mo.3	Mo.4
1. During this hospital stay, how often did nurses treat you with courtesy and respect?	82.4% (17)	83.3% (30)	87.5% (32)	95.5% (22)	83.3% (24)	94.7% (19)	92.9% (14)	85% (20)
2. During this hospital stay, how often did nurses listen carefully to you?	70.6% (17)	70.0% (30)	75% (32)	95.5% (32)	72% (25)	89.5% (19)	93.3% (15)	75% (20)
3. During this hospital stay, how often did nurses explain things in a way you could understand?	70.6% (17)	66.7% (30)	81.3% (32)	72.7% (22)	75% (24)	84.2% (19)	53.3% (15)	70% (20)
4. During this hospital stay, after you pressed the call button, how often did you get help as soon as you wanted it?	76.9% (13)	48.1% (27)	69.2% (26)	66.7% (18)	61.1% (18)	85.7% (14)	83.3% (12)	57.9% (19)

\*Note: each cell will have the percentage score and the number of patients surveyed, e.g. 85% (40 patient surveyed)

Table 3

Patient to provider mix before and after the implementation of staffing change

Total Patient to Provider Ratio with RN only skill mix				Grand Totals	Total Patient to Provider Ratio with LPNs in the skill mix				Grand Totals
Mo.1	Mo.2	Mo.3	Mo.4	SD	Mo.1	Mo.2	Mo.3	Mo.4	SD
				0.255					0.217
6.38	6.18	5.85	6.4	Mean 6.20	6.7	6.7	6.6	7.09	Mean 6.77

Table 4

Data Analysis and Report Plan for Aim 1.

		Treatment Mode		Statistics	Significance
		RN Only Skill Mix (N=746)	RN & LPN Mix (N=593)		
Fall Frequency	Yes	7	15	$\chi^2 = 5.176$	P=0.023
	No	739	578		

Table 5

Association of HCAHPS to the RN only and RN & LPN skill mix

HCAHPS Questions	RN only skill mix	RN & LPN skill mix	Statistics	Significance
1. During this hospital stay, how often did nurses treat you with courtesy and respect?	N=101	N=77	$\chi^2 = 0.05$	P=0.81
• Always	88	68		
• Never	13	9		
2. During this hospital stay, how often did nurses listen carefully to you?	N=111	N=79	$\chi^2 = 0.20$	P=0.66
• Always	87	64		
• Never	24	15		
3. During this hospital stay, how often did nurses explain things in a way you could understand?	N=101	N=78	$\chi^2 = 0.05$	P=0.83
• Always	74	56		
• Never	27	22		
4. During this hospital stay, after you pressed the call button, how often did you get help as soon as you wanted it?	N=84	N=63	$\chi^2 = 1.00$	P=0.32
• Always	52	44		
• Never	32	19		

Figure 1 Patient-nurse ratio per observation month.

