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An Educational Intervention to Enhance Nursing Competency in the Prevention and Treatment of Pressure Ulcers in the Rural Setting

Cassie M. Banks
Regis University

Regis University
Rueckert-Hartman College for Health Professions
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Disclaimer

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Executive Summary

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Problem

Nurses caring for patients "in the rural setting have faced a unique challenge in maintaining competency" (Banks, Gilmartin & Fink, 2010, p. E1), particularly when encountering uncommon complications. Although "educational programs can improve decision making," (Tweed & Tweed, 2008, p. 339) these programs must be carefully designed and implemented to achieve sustained practice changes and subsequently improve patient outcomes. The problem statement describing this capstone project is: In (P) nurses caring for hospitalized and nursing home patients in the rural setting, (I) will an evidence-based, multifaceted educational intervention related to pressure ulcer prevention and treatment, (C) when compared with no formal educational intervention, result in (O) enhanced nursing knowledge and confidence in caring for patients with or at risk for pressure ulcers?

Purpose

The purpose of this capstone project was to examine the impact of a multifaceted educational intervention on nursing knowledge and competency related to pressure ulcer prevention and treatment in nursing staff practicing in the rural setting.

Goal

The goal of this project was to measure the efficacy of the multifaceted educational intervention in assisting nurses to achieve and maintain knowledge and confidence related to pressure ulcer prevention and treatment.

Objectives

Project objectives included: to determine whether or not the educational intervention had a statistically significant effect on nursing knowledge over time; to determine whether or not the educational intervention had a statistically significant effect on nursing confidence over time; to identify correlations between demographic variables such as age in years, years of experience, and knowledge and confidence scores; and to determine which learning modalities were deemed most useful by nursing staff during the intervention.

Plan

Following a comprehensive literature review, a learning needs assessment was administered to the nursing staff and the multifaceted educational intervention was designed. Subsequently, an instrument for measuring pressure ulcer knowledge was identified and permission for use was granted from the instruments' author. Following Institutional review board approval from Regis University, the project was implemented and data was collected. Finally, pre- and post-tests were coded, data input into spreadsheets and the Statistical Package for the Social Sciences (SPSS) utilized to process data and determine the outcomes and results.

Outcomes and Results

A total of 19 participants completed both the pre- and post-intervention knowledge and confidence tests. A statistically significant improvement in mean knowledge scores was not noted between the pre- and the post-intervention period. However, a statistically significant improvement in nursing confidence was noted in the post-intervention period for three confidence items. Furthermore, the participants favored the skills lab as their preferred learning modality when compared with each of the other learning modalities offered during the educational intervention.

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An Educational Intervention to Enhance Nursing Competency in the Prevention and Treatment of Pressure Ulcers in the Rural Setting

The following project summary describes an educational intervention for nurses practicing in a rural setting. This education was delivered in a multifaceted format with the goal of enhancing nursing competency and confidence in caring for patients with and at risk for pressure ulcers. Competency was measured through the administration of a pre- and post-intervention knowledge assessment. Additionally, confidence was measured before and after the intervention.

Problem Recognition and Definition

Pressure ulcers have been identified as a major source of morbidity, contributing to poor patient outcomes and increased healthcare cost (Bergquist-Beringer et al., 2009). Further, the burden of chronic wounds is expected to continue to rise in the coming years (Benbow, 2009). According to Berquist-Beringer et al., the federal government has identified pressure ulcers as "a leading cause of preventable medical error" (p. 252), and the occurrence of pressure ulcers is now considered indicative of poor quality health care. However, the significance to nursing practice lies in the fact that pressure ulcers are preventable with appropriate nursing care and interventions (Benbow).

According to Banks, Gilmartin, and Fink (2010), nurses caring for patients "in the rural setting have faced a unique challenge in maintaining competency" (p. E1), particularly when encountering uncommon complications. One such complication is pressure ulcer prevention and treatment. According to Tweed and Tweed (2008), studies that address nursing knowledge of pressure ulcer prevention and management have yielded contradictory results. Although

"educational programs can improve decision making" (Tweed & Tweed, p. 339), these programs must be carefully designed and implemented to achieve sustained practice changes and subsequently improve patient outcomes. Those responsible for nurse education in the rural setting are charged with educating nurses in a manner that empowers them to provide knowledgeable and competent nursing care even in lower frequency patient care situations.

In the age of pay-for-performance and quality improvement initiatives, healthcare organizations are tasked with greater accountability and transparency (Kane & Radosevich, 2011). Kleinpell (2009) noted, "Knowledge of the process of outcomes measurement and available resources is essential for all advanced practice nurses (APNs) regardless of practice specialty or setting" (p. 2). According to Houser and Oman (2010), "Evidence in clinical practice is not solely limited to patient care" (p. 10). Therefore, it is the suggestion of this author that not all nurse-sensitive outcomes are patient indicators. With respect to this Doctor of Nursing Practice (DNP) project, the author has chosen outcomes measures that are indicators of nursing knowledge and confidence rather than patient indicators.

Problem Statement

A potential knowledge deficit was recognized several months ago while providing care for a patient with several pressure ulcers in the hospital. The nurses expressed concerns about how to care for these wounds and prevent new wounds from forming. Similar concerns were noted from the nursing home staff in the community. According to Zaccagnini and White (2011), "The DNP project focuses on a practice problem and the evidence-based solutions for that problem" (p. 454). It is believed that this project has attained both goals. Improved patient care is an almost universal goal of the continuous practice improvement projects of advanced practice

nurses, though the success of some projects may not be appropriately measured through patient outcomes directly but rather through related outcomes measures such as nursing knowledge or confidence. The goal of this project was to gain an understanding of whether or not an educational initiative to enhance nursing knowledge and confidence would better equip rural nursing staff to care for patients at risk for and with pressure ulcers. Population, intervention, comparison and outcome (PICO) describes the clinical problem or question facing the researcher. In summary, the problem statement describing this project is: In (P) nurses caring for hospitalized and nursing home patients in the rural setting, (I) will an evidence-based, multifaceted educational intervention related to pressure ulcer prevention and treatment, (C) when compared with no formal educational intervention, result in (O) enhanced nursing knowledge and confidence in caring for patients with or at risk for pressure ulcers?

Literature Review

Searches for publications related to nursing competence and educational interventions were completed using CINAHL, Medline, and OVID databases. Searches were completed using subject heading searches for nursing competence, competency, educational interventions, nursing education and clinical education, pressure ulcers, pressure ulcer prevention, pressure ulcer treatment, and pressure ulcer education. No articles less recent than ten years were utilized. Fifteen articles were gleaned with no relationship to pressure ulcers but were deemed relevant to the concepts of nursing competency and nursing education. See Appendix A for the Systematic Review of the Literature table completed for this study.

Nursing competency. A study by Burger et al. (2010) explored the differences in how nurses of various competency levels prioritize patient care. The study suggested beginning

nurses demonstrate linear thinking while more competent nurses were able to utilize more complex approaches to prioritizing patient care. Based on the results of their research, Burger et al. contend, "Understanding the needs of the advanced beginner nurse and the more experienced nurse will help address the issues related to responses to the complex care environment" (p. 509). In a similar study, Hoffman, Aitkin, and Duffield (2009) examined differences in cue utilization in decision making amongst novice and expert nurses caring for postoperative patients. The study affirmed that expert nurses demonstrated a keen ability to cluster cues together as determinants of patient condition and were more proactive in gathering cues. Additionally, Hoffman et al. asserted, "Novice nurses may need more guidance and education to understand the wide range of cues used by expert nurses in the care of patients and also which cues are the correct ones for particular decision situations" (p. 1341). Cowan, Norman, and Coopamah (2006) noted "The notion of competence was broad and involved a diverse set of qualities including: attitudes, motives, personal interests, perceptiveness, receptivity, maturity and aspects of personal identity (p. 21). Kubin (2010) contended, "Competency is a dynamic concept that requires an ongoing process to assess and validate capability in the work environment" (p. 32). Allen et al. (2008) suggested the definition of competency in nursing should be "expanded to include not only capabilities, but also the achievement of desired outcomes, with measurement reflecting nursing abilities beyond technical skills" (p. 81). The review of current literature reveals many conflicting concepts and ideals related to nursing competency.

Nursing confidence and competency. According to Freiburger (2002) "The nurse's personal self-concept, self-confidence, and professional self-concept are directly related to the nurse's level of competency" (p. 59). Moreover, "the application of competence, however,

requires self-confidence. Competence without self-confidence is insufficient" (Wagner, Bear & Sander, 2009, p. 373). Farrand, McMullan, Jowett, and Humphreys (2006) identified self-confidence as an essential element of competent clinical performance in their study of nursing students and the relationship between confidence and clinical skills. Additionally, higher self-confidence levels were related to enhanced interest and greater engagement in continuing professional development activities. The study demonstrated that "competency students had higher levels of confidence in areas of their practice such as provision and management of care, holistic orientation, lifelong learning, addressing quality standards and being a safe and competent nurse" (Farrand et al., p. 100).

Rural nursing challenges. According to McCoy (2009), nurses practicing in rural areas are faced with challenges not encountered in urban and suburban settings. Additionally, limited resources may impede the ability of nurses in the rural setting to achieve clinical competency through continuing education (McCoy). Penz et al. (2007) found barriers to participation in continuing educational activities are of concern for many rural and remote nurses and "educational opportunities relevant to rural area practice must be supported by employers, timely and affordable, and made available within rural and remote practice settings" (p. 65). Jukkala, Henly, and Lindke (2008) further explained continuing education must be offered in a modality accessible and acceptable to isolated rural health care providers. Moreover, a recent study by Bolin, Peck, Moore, and Ward-Smith (2011) noted the utilization of evidence-based information in the development of continuing education programs for rural nurses "increases the potential for the programs to be appropriate and valued" (p. 96) and nurses are subsequently more likely to attend.

Various educational modalities. A variety of ideals exist regarding best practices for educating nurses in the clinical setting. Van Gaal et al. (2010) found the utilization of an interactive and tailored educational program had a positive effect on nursing knowledge related to pressure ulcer prevention. Elliot, McKinley, and Fox (2008) described a quality improvement project utilizing one-on-one instruction related to pressure ulcer assessment training and skin assessment. The authors found a significant change in the culture of nursing related to pressure ulcer care and attributed this cultural change to the incorporation of evidence into practice. Uzen, Aylaz, and Karadag (2009) utilized a lecture format in their educational intervention and found "education regarding preventative care can be effective in reducing the incidence of pressure ulcers in the intensive care unit (ICU) setting" (p. 404). Tweed and Tweed (2008) found that an interactive lecture format improved nursing knowledge in the short term; however, knowledge soon returned to the pre-intervention baseline. An e-learning educational program studied by Beeckman, Schoonhoven, Boucque, Van Maele, and Defloor (2007) demonstrated utility of case studies in teaching nurses. However, Beeckman, Schoonhoven et al. noted repetition continues to be a necessity to sustain knowledge over time. Bergquist-Beringer et al. (2009) evaluated the National Database for Nursing Quality Indicators (NDNQI) training program for nurses and discovered this online pictorially based program was effective in educating nurses on pressure ulcer identification and staging.

Theoretical Foundation

"Scientific research and practice require a framework" (Zaccagnini & White, 2011, p. 13). Rogers' diffusion of innovation theory provided the framework for this project. Rogers (2003) illustrated the process of implementing change in his diffusion of innovation theory.

Rogers described innovation as “the process in which an innovation is communicated through certain channels over time among the members of a social system” (p. 5). Therefore the elements of diffusion are: innovation, communication channels, time, and social system. The innovation is the new idea or practice being introduced (Rogers). Rogers further explains “perceived attributes of innovations” (p. 15) such as relative advantage, compatibility, complexity, trialability, and observability affect the rate at which an innovation may become adopted. A communication channel is a “means by which messages get from one individual to another” (Rogers, p. 18). Time is the third component of diffusion and is conceptualized by Rogers as the innovation-decision process. The innovation-decision process includes: knowledge, persuasion, decision, implementation, and confirmation (Rogers). A social system was defined by Rogers as “a set of interrelated units that are engaged in joint problem solving to accomplish a common goal” (p. 23). Within the social system factors such as social structure, opinion leaders, and change agents have a bearing on the acceptance of an innovation. Based on prior experiences with clinical nursing education and a systematic review of the literature, it is the belief of this author that well designed clinical nursing education can enhance nursing knowledge and confidence, instill a sense of inquiry, demonstrate the importance of evidence-based practice, and address various learning styles.

Market/Risk Analysis

Strengths, Weaknesses, Opportunities, and Threats

Strengths of the project included the utilization of a variety of learning modalities in an attempt to cater to a variety of learning styles. In addition, the skills lab portion of the multifaceted educational intervention provided each nurse an opportunity to practice the

knowledge and skills gained in a safe environment prior to applying newly learned techniques to patient care. The project also boasted champions as facilitators of change. According to Houser and Oman (2011), champions influence change through excitement and modeling of proposed practice changes. Moreover, these champions will be imperative in sustaining evidence-based practice changes long after the educational initiative has ended.

There are some weaknesses inherent to a project focused upon nursing education in a rural setting. One such weakness is the small sample size, which was limited by the number of nursing staff available to participate from the three target facilities. The small sample size does threaten the validity of the study. Additionally, the multifaceted nature of the proposed educational methodology makes reproducing the intervention time and labor intensive. This particularly methodology may not be well suited for settings in which the education is time sensitive in nature. The acquisition of equipment such as mannequins for a project of this type can be expensive, though it can be argued the benefits of evidence-based nursing practice changes and opportunity to impact patient morbidity and mortality far outweigh the cost of this type of intervention (Collins, 2008).

The design of this project offers several opportunities to expand the project or apply the principles to other settings or topics. The post-intervention assessment could be repeated at various intervals following the educational intervention to assess the maintenance of knowledge across time. Additionally, the multifaceted educational methodology could be applied to various types of clinical nursing topics, particularly those with a skills component. Finally, this type of intervention is replicated relatively easily and could be utilized in a variety of clinical settings, units, or facility types.

Zaccagnini and White (2011) note project leaders should consider and attempt to foresee potential threats to a project. Whenever a project is dependent upon the cooperation of others to be successful, the potential for problems exists. Within the design of this study, the author identified several scenarios that could have potentially threatened the success of the project and compromised the outcomes. The possibility of an excessively low number of participants in the pre- and post-testing periods or during the lecture and skills lab portion was a potential threat. In addition, the receptivity of the nursing staff to the educational initiative could have had a substantial impact on the success of the intervention. Moreover, the ability to recruit, train, inspire, and retain champion nurses throughout the intervention and beyond may have been a challenge and potential threat. Finally, the ability of each facility to obtain and use the equipment (e.g. air mattresses and gel chair pads) and dressings recommended by the evidence was a significant threat to the project.

Several potential threats to validity also existed in this project. With regard to threats to internal validity, history was a consideration. According to Kane and Radosevich (2011), history is an event that takes place outside the study and is not part of the intervention. One consideration was the recent certification of one of the nurses in wound care specialty. Although her wound care certification will ultimately benefit the patient care area, her recently acquired knowledge could have skewed some of the data. Testing is another consideration because the knowledge and confidence instruments were used repeatedly during the course of the study. Knowledge and confidence were measured in the pre- and post-intervention period. However, this may have threatened internal validity. The threat of instrumentation was also applicable to this research project as it was likely participants became experienced to some degree in the time

elapsing between the pre- and post-intervention periods (Kane & Radosevich). The threat of experimental mortality or attrition existed during this project because the project took place over a period of weeks to months, there was a likelihood that some study participants left their positions and thus affected the internal validity of the study.

With regard to threats to external validity, selection effect was a pertinent concern. Because the project included participants from three different facilities with different mixes of registered nurses (RNs) and licensed practical nurses (LPNs), the differences between the groups may have threatened the external validity and overall generalizability of the study. Additionally, novelty effects may have been a concern because the intervention was exciting and novel; however, as the intervention transpired over time, some may have lost interest and this may have affected the commitment to learning and post-test scores. Finally, experimenter effect should be considered. Because the principal investigator was also a care provider who each of these groups work with regularly, there was potential for pressure on the participants to act or perform in a certain manner.

Need, Resources, and Sustainability

According to Zaccagnini and White (2011), the needs assessment serves to determine the extent to which the mission of the project is consistent with the needs of the target population. The need for the project and nursing education related to the topic of pressure ulcer prevention and treatment was established through a conversation with administrators/educators at the target facilities and through the administration of a needs assessment. The needs assessment was administered in early 2011 and revealed low levels of nursing confidence related to the care of patients with or at risk for pressure ulcers. The needs assessment also served to identify areas of

weakness and contributed to the content development for the lecture and skills lab portions of the intervention.

The resources required to undertake a project of this type were relatively few. Much of the appeal of this type of intervention relates to the fact this educational methodology is relatively economical and efficient. Resources required included the advanced practice nurse with the impetus to become involved in process improvement, volunteer champions from the nursing staff, equipment for the skills labs (including the mannequin and various types of dressings), and the time (paid or volunteer) for the nursing staff to attend the educational offerings. Posters illustrating pressure ulcer staging and various dressing types were created and posted on each nursing unit. The educational content was presented in the form of a PowerPoint presentation in a lecture style format with a skills lab immediately following. The skills lab utilized the *Pat Pressure Ulcer* mannequin obtained through educational funding from one of the target health care facilities. The mannequin allowed participants to practice staging various types of pressure ulcers as well as perform dressing changes utilizing recommended materials for each type of ulcer. Following the educational intervention and skills lab, a journal club was offered to discuss a research article focused on evidence-based pressure ulcer prevention and treatment. Additionally, pocket sized reference cards containing information related to pressure ulcer staging and recommended dressing types were created and distributed to nursing staff.

Some of the educational modalities utilized in the project were designed to become sustainable references for the nursing staff following the completion of the project. The educational posters were hung in each nursing unit and the pocket reference cards were designed as references to be utilized following the completion of the intervention. Additionally, the

sustainability of the evidence-based changes that were the focus of the project was largely dependent upon the success of the champion nurses. The role of the champions was to model evidence-based changes in practice and to act as resources to other nurses. The structure of the program was designed to reinforce the importance of best practices. The utilization and training of champion nurses was intended to foster a desire for not only continued best practice utilization with regard to pressure ulcer prevention and treatment, but also to encourage other best practice initiatives and praxis among nursing staff. The empowerment of nursing staff through knowledge and skill is beneficial to nursing staff and patients alike. Certainly the role of the DNP is one of continuous practice improvement, partnership, and collaboration with the focus population of nurses as imperative to the sustainability of any practice change.

Stakeholders and Project Team

Stakeholders are defined by Zaccagnini and White (2011) as those individuals who are affected by the project. The direct stakeholders included patients, nursing staff, medical staff, facility administrators, project champions, and the project leader. Ancillary stakeholders included regulatory agencies, public and private insurers, and members of the community.

The project team included the team leader, consulting wound care nurse specialist, and six project champions (two representatives from each facility). The team leader (DNP student) was responsible for the project design, educational content, and leading the educational programs. The wound care nurse specialist reviewed each facet of the educational intervention to ensure it was indeed in agreement with current practice standards and current best practices, as well as ensuring each change was feasible for the facility given resources and available supplies. The project champions were responsible for understanding the science behind the education and

proposed practice changes as well as role-modeling best practices for pressure ulcer prevention and treatment. These individuals acted as resources to other nurses who had questions or concerns related to the care of patients at risk for or with pressure ulcers. The champions were provided with resource binders containing research evidence and information related to pressure ulcer prevention and treatment. Additionally, the posters and pocket cards created during the intervention will serve as continued resources for nursing staff to reference in the future.

Cost-Benefit Analysis

The total cost of the project including materials and productive nursing time (which was donated by each facility) was estimated at $1685 (Appendix F). The total benefit of the project was estimated at $37,800 per incidence of a pressure ulcer. The cost of the project implementation was insignificant in comparison to the potential monetary savings associated with decreased incidence and increased prevention of pressure ulcers. Furthermore, the potential benefit to patients should not be measured solely in monetary value but rather quality of care rendered and avoidance of pain and suffering. Moreover, no monetary value can be placed upon the empowerment acquired by nurses participating in this type of evidence-based practice initiative.

Project Objectives

Mission and Vision

The mission of this project was to enhance nursing knowledge and competency regarding pressure ulcer prevention and treatment. The intended consequence of enhanced nursing knowledge and competency is improved patient safety, reduced morbidity and mortality and decreased pain and suffering. Moreover, a principal focus in this project was to demonstrate the

efficacy of the multifaceted educational initiative in achieving and sustaining nursing knowledge of a given topic area over time. By demonstrating the efficacy of the multifaceted educational intervention, it is the vision of this author that this type of education will be utilized more routinely in the realm of clinical nurse education, particularly in the rural setting where nurses have fewer resources for continuing nursing education.

Goals

The foremost goal of this project was to measure the efficacy of the multifaceted educational intervention in assisting nursing to achieve and maintain knowledge and confidence related to pressure ulcer prevention and treatment. Ancillary goals included appropriate practice changes reflective of current best practices and based upon the evidence and improved patient outcomes including lower incidence of pressure ulcers, enhanced patient safety, and improved quality of life. An additional goal was the demonstration of an evidence-based educational initiative for the nursing staff in an effort to empower nurses with the knowledge and desire to pursue other types of evidence-based practice projects.

Outcomes Objectives

The first objective of this capstone project was to determine whether or not the educational intervention had a statistically significant effect on nursing knowledge over time. A 26-item knowledge assessment instrument developed and validated by Beeckman, Defloor, Demarre, Van Hecke, and Vanderwee (2010) was utilized to measure knowledge in the pre- and post-intervention period (Appendix D). Mean knowledge scores were determined in the pre- and post-intervention period and a dependent groups t-test was utilized to determine if a statistically significant difference in means existed in the post-intervention period.

The second objective of this capstone project was to determine whether or not the educational intervention had a statistically significant effect on nursing confidence over time. The Likert scale was utilized to measure confidence related to staging, preventing and caring for pressure ulcers in the pre- and post-intervention period. The mean confidence scores for each item were calculated pre- and post-intervention and analyzed using a dependent groups t-test to determine if a statistically significant increase in confidence occurred in the post-intervention period.

A third objective was to identify correlations between demographic variables such as age in years, years of experience, and knowledge and confidence scores. A Pearson's r correlation was used to identify strong positive or negative correlations between variables.

The final objective was to determine which learning modalities were deemed most useful by nursing staff during the intervention. A Likert scale was used to assess the effectiveness of each facet of the educational intervention in the acquisition of knowledge. Participants rated the perceived efficacy on a scale from 1 (being equal to least effective) to 6 (being equal to most effective). The mean usefulness score for each item was calculated and reported with the other results.

Evaluation Plan

Logic Model

According to Earp & Ennett (1991), a conceptual model is "a diagram of proposed causal linkages among a set of concepts believed to be related to a particular public health problem" (p. 164). Further, Kane and Radosevich (2011) stated that project development requires clearly

delineated causal relationships. The conceptual map for this project reflects these descriptions (Appendix B).

The first two steps of the conceptual model described the identified practice problem, a knowledge deficit for nurses practicing in the rural setting. According to Zaccagnini and White (2011), "The advanced practice nurse, particularly the DNP, is in the best position to effect and assess change within the clinical setting" (p. 90). It is the observation of this author that nurses in the rural setting have fewer resources related to continuing nursing education, have less access to advanced practice nurse (APN) leadership, and see various types of high-risk patients less frequently. According to Jukkala, Henly, and Lindeke (2008), several barriers exist for rural nurses continuing educational endeavors including limited time, lack of financial resources for participation, and the isolated locations inherent to rural and remote communities. For these reasons, a knowledge deficit can develop insidiously over time and nurses may adopt a "because we have always done it that way" attitude.

The next step of the Logic Model illustrated the search for evidence to support a practice change. Additionally, a review of the latest evidence-based guidelines for the prevention and care of pressure ulcers was necessary to create an educational program reflective of current best practices, which are evidence-based. This was accomplished through the systematic review process.

The design intervention to trigger practice changes describes the step of designing the educational intervention to meet the needs of nurses working in the rural setting. This was accomplished through first administering a needs assessment, which identified potential areas of knowledge deficit as well as learning preferences. Subsequently, the multifaceted educational

intervention was designed with various learning styles and preferences in mind. By utilizing various learning modalities such as skills lab, online learning module, lecture, pocket reference cards, posters placed on the units, and journal club, the likelihood of acquisition of knowledge is improved.

Zaccagnini and White (2011) describe the evaluation of practice changes as "essential to the successful implementation of any . . . evidence based practice initiative" (p. 97). Therefore, the proposed outcomes of the project were improved nursing competency and confidence. Competency can be demonstrated through improved test scores on a knowledge test. However, competency alone may not be enough to improve patient outcomes. Therefore, an increase in the level of nursing confidence is also desirable. Through reiteration of the concepts learned through practice and observation of clinical champions of change, it is anticipated proposed practice changes will become sustainable. Moreover, when nurses understand and embrace best practices, patient care will ultimately be impacted positively.

Population and Sampling Parameters

According to Cohen (1992), "In research planning, the investigator needs to know the N necessary to attain the desired power for the specified alpha" (p. 156). Power analysis performed a priori can assist the researcher in determining the sample size (*N*) necessary to achieve power (Polit, 2010). In order to approximate *N*, a Cohen's *D* must be assumed. Assuming a Cohen's *D* of 0.8 or large effect size, the minimum number of participants needed was 42. If Cohen's *D* is set at 0.5 or medium effect size, the minimum sample size is 51 participants. In this particular project, the sample size was somewhat limited by the number of staff available to participate at the three facilities in the target community. Initially, there were plans to include only registered

nurses in the project. However, upon further examination of the staffing matrices at the three facilities, it became clear a sample of roughly 18 registered nurses would likely not have a great deal of power. Additionally, the review of literature reinforced the importance of support staff in the overall pressure ulcer prevention effort and thus it was decided that LPNs would also be included in the study intervention and sample.

Setting

The population of focus was nurses practicing in the rural setting. Study participants included nurses practicing at three rural health care facilities; one acute-care and two long-term care facilities. Inclusion criteria included: RNs and LPNs. Exclusion criteria were: less than part-time employment status (less than 0.5 full time equivalents (FTE)). There was no compensation for study participation, and recruitment took place at staff meetings at all three facilities. The sample size was limited by the number of nurse staff members who were available to participate at the three facilities in the target community.

Methodology and Measurement

The capstone project utilized a pre-test, post-test, quasi-experimental design in which the independent variable was the multifaceted educational intervention. This educational program consisted of a skills lab, an online learning module (National Database for Nursing Quality Indicators (NDNQI) training module), lecture, posters placed on the units, pocket reference cards, nursing journal club, and the utilization of unit champions of change. The dependent variables for the project were increased nursing knowledge related to pressure ulcer prevention and treatment and enhanced nursing confidence related to the care of patients with or at risk for

pressure ulcers. Nursing knowledge was measured through the utilization of a pre- and post-test of knowledge and pre- and post-test of confidence as measured on a Likert scale.

Missing and incomplete data was something first encountered in the evaluation of the needs assessment surveys. Many participants completed the sections in which they were only required to circle an answer; however, the sections requiring free text of yes or no answer were often left incomplete. According to Polit (2010), "the first defense for missing values is to make every effort to avoid the problem in designing the study and collecting the data" (p. 366). So in this case, the knowledge and confidence instruments were designed with answers that can be circled rather than free text to increase compliance in answering. Additionally, other factors that should be considered when creating a plan to deal with missing data include: extent of the missing data, patterns, nature of missing data, and role of the variable and the level of measurement of the variable (Polit). Some of the more likely fields to have been left unanswered involved demographic variables such as age, years of experience, and specialty area.

According to Kane and Radosevich (2011), the usefulness of a specific measure can be established through the assessment of reliability and validity of a measure. For the purposes of this research study, a 26-item knowledge assessment tool developed and validated by Beeckman, Defloor et al. (2010) was utilized to measure knowledge in the pre- and post-test for the intervention period. A Likert scale was utilized to measure nurse's confidence utilizing the pre- and post-test during the intervention period with questions, such as: please rate your confidence on a scale in identifying patients at risk for pressure ulcers, with one being equal to least confident and five being equal to most confident. Confidence was chosen as an outcome measure

based on a review of the literature that determined confidence and competency in nursing are closely inter-related.

Both the measures of knowledge and confidence are generic measures. According to Kane and Radosevich (2011), these measures are "broadly applicable across . . . treatments (or interventions), and demographic groups" (p. 85). Even though the specific knowledge and confidence being measured are specific to pressure ulcer education, the broader concepts of knowledge and confidence measurement can be applied to any number of nursing educational interventions. In addition "generic measures should be collected at baseline (as well as follow up)" in order to make meaningful comparisons (Kane & Radosevich, p. 99).

Human Subjects Protection

The population of focus for this capstone project study was nurses practicing in the rural setting. No patients were directly involved in this research project. Although this population was underserved from a standpoint of lack of professional and educational resources, these nurses were not a vulnerable population. Per Dr. Cullen's lecture addressing human subjects considerations in research, vulnerable populations consist of children, elderly, pregnant women, and prisoners (P. Cullen, personal communication, June 18, 2011). Therefore, this target population of nurses was not likely to be considered a vulnerable population.

As Dr. Cullen stated, the researcher must continually ask during the research process what is right, what is proper (P. Cullen, personal communication, June 18, 2011)? Further, harm to subjects must be evaluated in the context of the situation. Although the nurses in the study were not vulnerable, the investigator has immense responsibility to the study subjects and must remain mindful of each of the ethical principles governing research ethics. The project was

granted exempt status by the Regis University Institutional Review board on September 30, 2011 (Appendix G).

The principle of autonomy applies to this research from the standpoint of allowing individual participants to make informed decisions regarding their participation or exclusion from the educational activities involved with this project. It was the duty of the principle investigator to maintain open communication with study subjects so that they had an in depth understanding of the educational program and the measurement of knowledge and confidence in the pre- and post-tests.

The principle of beneficence was the essence of the goals of this research project. It was the hope of this author the knowledge gained through this educational initiative would be of benefit to nurses and patients and ultimately improve patient outcomes, as well as nurture a culture of evidence-based practice. Additionally, the principle of nonmaleficence is achieved in part through participation in the education offered, knowledge gained, and prevention of harm to future patients because of the enhanced awareness of best practices for pressure ulcer prevention and treatment.

As the principle investigator, the principle of respect for persons was of utmost importance. Even though this research project could potentially benefit many patients and nurses, all participants involved in the study needed to be treated fairly.

The principles of fidelity and veracity were particularly important in the proposed project given the scope and commitment of time. It was imperative that commitments were kept and time balanced in a manner that allowed for adequate time and energy to be devoted to the educational initiative. Additionally, accountability to the study participants for having a firm

understanding of the material being taught was necessary. Because study participants may have accepted the educational content as factual, it was imperative the material be representative of the latest evidence and consistent with current best practices, and it was the responsibility of the principle investigator to ensure this occurred.

The identity of participants in this study was confidential. All names were coded for the protection of the participants and kept in a password-protected computer at the target facility when not being used for data analysis. The password was kept and secured by the principle investigator only. The results of the study, including laboratory or any other data, do not give participant's name or include any identifiable references. These records will be kept protected for five years and then destroyed as permitted by law.

Each ethical principle describes the considerations and responsibilities of a principle investigator. Whether dealing with a vulnerable population or not, the responsibilities to study participants must be at the forefront of the research process. See Appendix H for Collaborative Institutional Training Initiative (CITI) certification completed by the author.

Instrument Reliability and Validity

The pressure ulcer knowledge assessment instrument was developed and validated by Beeckman, Defloor et al. (2010). The purpose of the instrument is to measure a wider range of knowledge related to pressure ulcers than other instruments currently available and pertains to six areas deemed most relevant to pressure ulcer prevention (Beeckman, Defloor et al.). These six areas include: etiology and development, classification and observation, risk assessment, nutrition, preventative measures to reduce the amount of pressure/shear, and preventative measures to reduce the duration of pressure/shear. During the development of the instrument,

members of the European Pressure Ulcer Advisory Panel evaluated face and content validity using a double Delphi procedure (Beeckman, Defloor et al). Additionally, an extensive literature review was completed to establish content validity. The content validity index ranged from 0.78 to 1.00 and the item difficulty index ranged from 0.27 to 0.87. Cronbach's alpha for the entire instrument was equal to 0.77 and the one-week test-retest reliability (measured using the intraclass correlation coefficient) was 0.88 (Beeckman, Defloor et al.). Overall, the knowledge instrument was found to have acceptable validity and reliability properties. Based on these findings, this was an appropriate tool for utilization in this project.

Project Findings and Results

The 20.0 Statistical Package for the Social Sciences (SPSS) was used to analyze the data. All data were transferred from an Excel spreadsheet and imported into SPSS and all subjects and variables were coded. Each subject was coded using a number as the data were entered into Excel. The circumstance of no answer to a particular instrument item was coded 999 and non-participation by a subject in a particular intervention was coded 888. Descriptive statistics were run on all variables with means, percentages, and ranges for the variables of age and years of experience. For answers using the Likert scale, a no answer code was included. Additionally, dummy coding for missing variables with codes such as 888 or 999 was utilized and reported alongside the rest of the results in the frequency tables. Tests of difference (paired t-tests) and correlation (Pearson's r) were conducted. Associations for age and test score, years of experience and test score, years of experience and level of confidence were conducted. Alpha was set at 0.05.

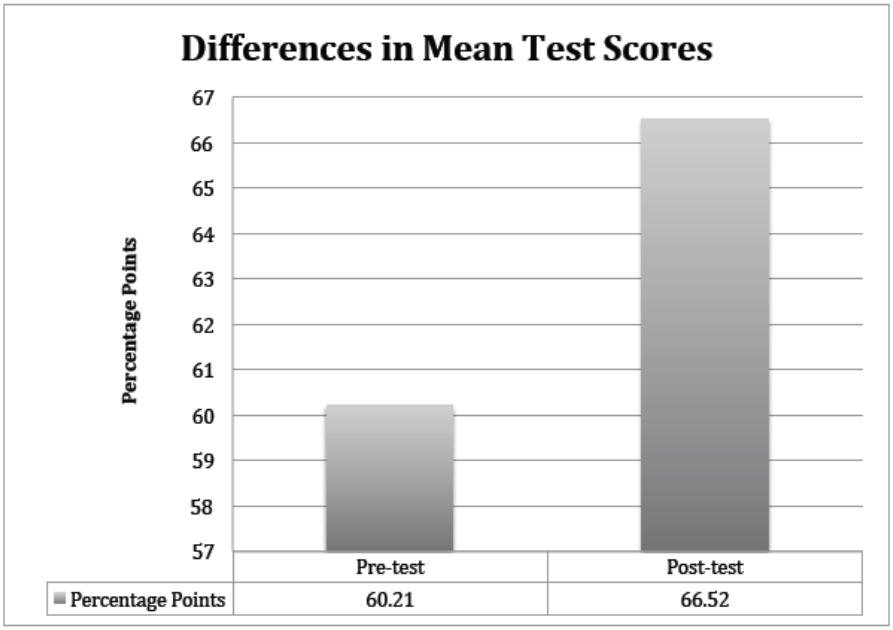
Description of the Sample

These findings describe the sample of nurses who completed both phases of the study. In phase one *n* = 29, and in phase two *n* = 19. The mean age of study participants was 49.97 (± 10.22) years with a range of 27 to 64 years. The mean nursing experience of study participants was 18.6 (± 11.34) years with a range of 2 to 42 years. Number of participants per department specialty areas were as follows: medical/surgical inpatient = 10; and nursing home = 9.

Objective One

The first objective of this capstone project was to determine whether or not the educational intervention had a statistically significant effect on nursing knowledge over time. The findings of the data analysis were not statistically significant for improvement over time ($p = 0.69$). Paired t-tests were utilized to determine significance. The mean knowledge test score on the pre-test was 60.21 (±11.35) percentage points with a range of 40 to 80. The mean knowledge test score on the post-test was 66.52 (±9.25) percentage points with a range of 44 to 84. See Figure 1. Although improvements in mean test scores were noted in the post-intervention period, the improvement was not statistically significant.

Figure 1. Differences in mean test scores in the pre- and post-intervention periods.

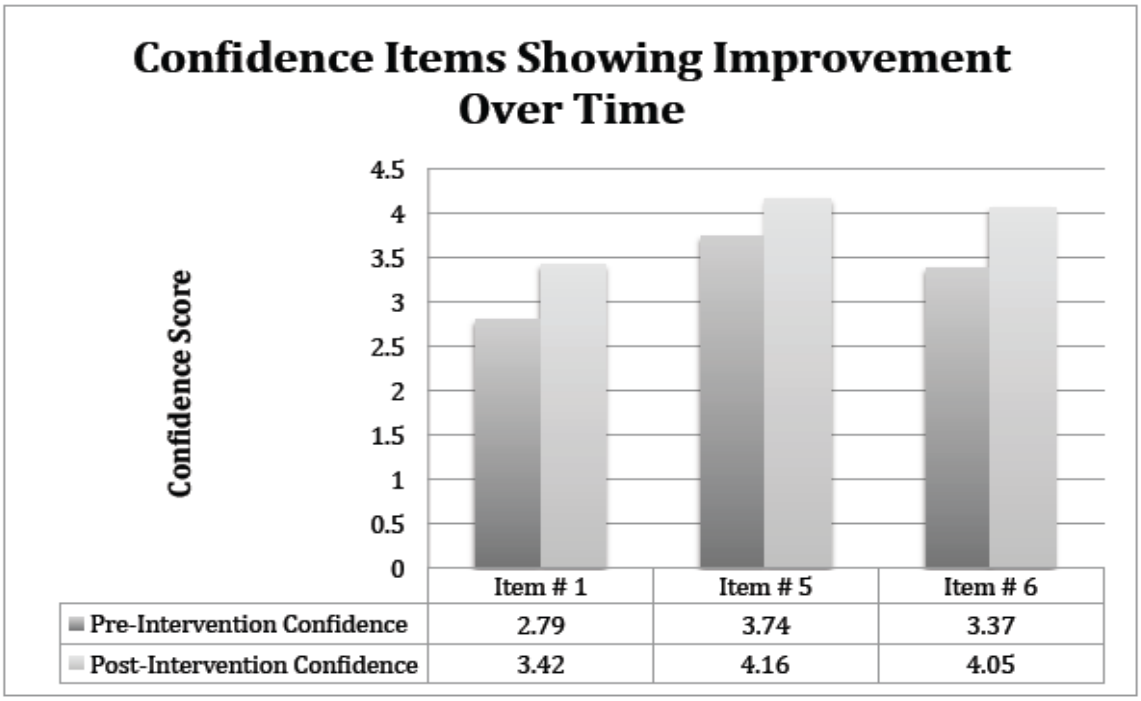


Objective Two

The second objective of this capstone project was to determine whether or not the educational intervention has a statistically significant effect on nursing confidence over time. The confidence assessment portion of the pre- and post-tests included the following statements: 1) Rate your current level of confidence in staging pressure ulcers; 2) Rate your current level of confidence in caring for patients with stage 1 pressure ulcers; 3) Rate your current level of confidence in caring for patients with stage 2 pressure ulcers; 4) Rate your current level of confidence in caring for patients with unstageable pressure ulcers; 5) Rate your current level of confidence in identifying those patients at risk for the development of pressure ulcers; and 6) Please rate your current level of confidence related to the prevention of pressure ulcers in at-risk patients. Items one, five, and six were noted to have statistically significant improvements in confidence over time. With regard to item one, the average confidence level in the pre-intervention period was 2.79, while the post-intervention assessment yielded an average

confidence level of 3.42. The increase in confidence for item one was noted to be statistically significant (p = .007). With regard to item five, the average confidence level in the pre-intervention period was 3.74, while the post-intervention assessment demonstrated a confidence level of 4.16. This increase in confidence was noted to be statistically significant (p = 0.028). Lastly, with regard to item six, the average confidence level in the pre-intervention period was 3.37, while the post-intervention period level was found to be 4.05. A statistically significant increase in confidence level was noted for this time (p = .006).

Figure 2. Confidence items demonstrating statistically significant improvements in scores in the post-intervention period.



Objective Three

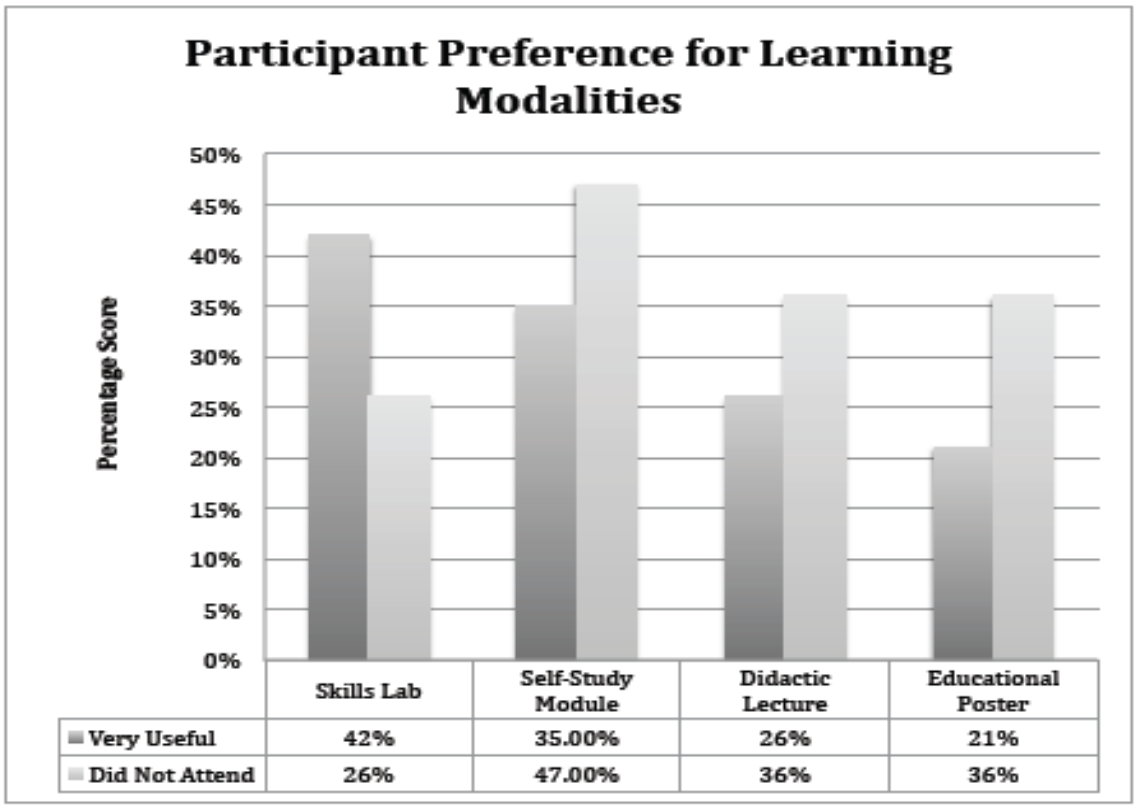
A third objective was to identify correlations between demographic variables such as age in years, years of experience, and knowledge and confidence scores. A Pearson correlation was used to identify positive correlations between variables. A correlation matrix was created to discover correlations among the following variables: age and test score; years of experience and test score; years of experience and level of confidence; and age in years, knowledge test score and level of confidence. No significant correlation was noted between age and pre- or post-test knowledge test scores. Furthermore, no significant correlation was noted between years of experience and pre- or post-test knowledge test scores. Additionally, no significant correlation between age in years and confidence scores on any of the confidence items was identified. Notably, a statistically significant positive correlation was noted between years of experience and confidence item six in the post-intervention period ($r = .681$).

Objective Four

The final objective was to determine which learning modalities were deemed most useful by nursing staff during the intervention. As part of the post-test, preference questions were posed addressing which learning modalities were most helpful for study participants in acquisition of knowledge. For each intervention, the participant was asked to rate the degree of preference for the intervention from strongly agree to strongly disagree or did not attend. For example, “the skills lab was helpful in my learning.” The question was posed for each type of learning modality (see Appendix D). The skills lab was the preferred learning modality with 42% of the participants rating it very useful, while 26% did not attend. The self-study module was rated very useful by 35% of participants, while 47% of participants report not completing the self-study module. The didactic lecture was deemed useful by 26% of the participants, while

36% reported non-attendance. Finally, the educational posters were deemed useful by 21% of the participants, while 36% reported having no experience with the posters placed on each unit. The lecture, online learning module, and skills lab were deemed most useful in the acquisition of knowledge by participants.

Figure 3. Participant preferences for specific learning modalities.



Limitations, Recommendations, and Implications for Change

Limitations

One major limitation involved the lack of clear definition of competency. Because competency remains poorly defined in the literature, there are certainly questions related to the efficacy of a given intervention in enhancing or affecting competency. Furthermore, the

relationship between confidence and competency has yet to be clearly delineated in the literature and therefore the utility of improvements in confidence as an indicator of overall competency could be questioned. Moreover, the pre-test, post-test methodology utilized in this project provides useful data for comparison; however, the potential for historical effects exists. A substantial attrition rate (34%) from the pre-test to post-test is a key limitation of this project and weakened the power of this study with already low numbers.

Although the multifaceted educational intervention was considered useful by participants in the acquisition of knowledge and yielded higher confidence levels in the post-intervention period, the format of the program made it time-consuming and resource dependent. Lastly, although the reliability and validity of the knowledge tool are well established through research, the addition of the non-validated confidence questions to the pre- and post-test could impact the reliability and validity of the assessment tool as a whole.

Recommendations

A significant quantity of literature exists on various educational modalities for providing education to nurses. However, to date very little research has explored a multifaceted approach to nurse education. In the rural setting, where resources are few and specific patient conditions or situations may be infrequently encountered, nursing competency is imperative. Effective modalities for achieving and maintaining nursing competency in the rural setting must be identified. More research with larger numbers of nurses participating in similar research studies is necessary to affirm or disaffirm the multifaceted educational approach as a legitimate option for rural nurse education. Moreover, in the future, the measurement of patient outcomes in addition to measures of nurse competency will be imperative in confirming the efficacy of a

specific modality. In this regard, an enhanced quality of nurse education could be linked to improved patient outcomes. Additionally, measurement of perceived nursing competency as part of an assessment could provide useful information. Finally, the application of the multifaceted educational format to other areas of clinical practice should be considered in order to further contribute to what is known about nursing education in the rural setting.

Implications for Practice

The implementation of evidence into practice has far reaching benefits for both patients and nurses. While this project's findings cannot be generalized, it is suggestive of the possibility of improved learning for nurses in the rural setting. Further research is needed to affirm the efficacy of the multifaceted educational methodology in rural nurse education; the implications of high-quality, evidence-based, effective nursing education are many. Some changes such as offering educational sessions at a variety of times and using a variety of teaching methodologies require little more than creativity. However, some changes such as the implementation of skills labs as a teaching modality require both fiscal and manpower resources. The utilization of champions to assist in the educational process is supported by theory and practice and is therefore recommended as an important component of clinical nursing educational initiatives. Rogers' diffusion of innovation theory also describes the use of communication channels as imperative to the diffusion of an innovation; the utilization of a variety of communication channels (teaching modalities) in this project is supported by theory and practice (Rogers, 2003). Although potentially costly, the prevention of one nosocomial pressure ulcer has been estimated at $37,800 per incidence (Bryant & Nix, 2007). Furthermore, the potential advantages of regulatory compliance, enhanced insurance reimbursement and nursing staff empowerment are

far reaching. The precedence of evidence-based practice initiatives and involvement of nursing staff in this type of practice improvement has the potential to positively impact both patients and nurses.

Summary

The shift toward improvements in quality of care and enhanced awareness of the devastating impact of pressure ulcers necessitates improved clinical nursing education. "Because no consensus exists on what type of educational style is best, a multifaceted intervention is suggested as the superior method of educating nursing staff" (Banks et al., 2010, p. E6). Such educational interventions must be well planned, deliberately marketed to nursing staff, carefully implemented and most importantly, theory-guided. This project demonstrated the efficacy of a multifaceted educational methodology in enhancing nursing confidence; however, a statistically significant improvement in nursing knowledge was not observed. More studies utilizing larger numbers of nurses are needed to affirm or disaffirm the efficacy of this methodology. High quality, effective clinical nursing education is imperative to ensure that optimal patient outcomes are achieved.

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Appendix A

Systematic Review

Primary Outcome Measures and Results	Results of knowledge assessment, association between level of ICU experience and test scores	Low classification skills on the pretest, after the intervention, skills improved. Among qualified nurses there was no difference in results.	Identification of themes. 11 themes identified: physical impact, social impact, psychological effects, pressure ulcer symptoms, general health, healthcare professional-client relationship, need for versus effect of interventions, impact of others, financial impact, perceived etiology, and the need for knowledge.
Author Conclusions/ Implications of Key Findings	The educational program improved knowledge but knowledge returned to baseline in the post intervention period.	The classification skills of all nurses and nursing students increased by both learning methods, repetition is necessary.	There is evidence that pressure ulcers and pressure ulcer interventions have significant impact on HRQL and cause substantial burden to patients.
Strengths/ Limitations	Did not assess performance, patient outcomes, baseline test performed under observation	Limitations: convenience sampling, high attrition rate, intraobserver reliability, one dimensional photographs used for teaching	Strengths: international collaboration, mixed methodological review, quantitative measurement informs us about the physical effects of pain. Weaknesses: poor quality of RCTs, methods of administration poorly described, all RCTs excluded for this reason.
Funding Source	None Disclosed	None Disclosed	Smith and Nephew
Comments	Educational program for pressure ulcer prevention applied to ICU nurses. ? Contact authors for program.	Suggests that the use of cases rather than one dimensional photographs would be useful	A significant amount of literature reviewed with international collaboration.

Student Name: Cassie Banks, DNP(c)

Article Title and Journal	Intensive Care Nurse's Knowledge of Pressure Ulcers: Development of an Assessment Tool and Effect of an Educational Program - American Journal of Critical Care	Pressure ulcers: e-learning to improve classification by nurses and nursing students - The Journal of Clinical Nursing - Journal of Clinical Nursing	Impact of Pressure Ulcers on Quality of Life in Older Patients: A Systematic Review - The Journal of the American Geriatrics Society
Author/Year	Tweed & Tweed 2008	Beeckman, Schoonhoven, Boucque, Van Maele & Defloor, 2007	Gorecki, Brown, Nelson, Briggs, Schoonhoven, Dealey, Defloor, Nixon, 2009.
Database and Keywords	CINAHL, pressure ulcers, nursing, education	CINAHL, pressure ulcers, nursing , prevention, education	CINAHL, health-related quality of life; pressure ulcer; systematic review
Research Design	A pre-test, post-test intervention study	Repeated measure pre-test, post-test	systematic review, metasynthesis of primary research
Level of Evidence	ONS Level I	ONS Level I	ONS Level I
Study Aim/Purpose	To assess ICU nurses' knowledge of pressure ulcers and the impact of an educational program on knowledge levels	To detect problems when classifying pressure ulcers and to examine whether an e-learning program is able to increase classification skills in qualified nurses and nursing students.	To identify the impact of pressure ulcers and pressure ulcer interventions on health related quality of life.
Population Studied/Sample Size/Criteria/Power	Sample: 62 ICU nurses, Criteria was attendance of the educational program	Sample: 212 nurses, 214 nursing students, convenience sample	Population: Adults with pressure ulcers in acute, community and long term care settings. Sample: 31 studies including 2,436 participants with pressure ulcers. Age Range from 17 to 96 years.
Methods/Study Appraisal/ Synthesis Methods	Pre-test, Post-test, multivariate analysis	pretest with three posttests	systematic review with quality assessment criteria

Article Title and Journal	Economic Evaluation of Pressure Ulcer Care: A Cost Minimization Analysis of Preventative Strategies - Nursing Economics	Knowledge, attitudes, and practice among nursing staff concerning pressure ulcer prevention and treatment - a survey in a Swedish healthcare setting - Scandinavian Journal of Caring Sciences
Author/Year	Schuurman, Schoonhoven, Defloor, Engelshoven, Ramhorst & Buskens, 2009.	Kaalman & Suserud, 2009
Database and Keywords	CINAHL, cost, pressure ulcers, impact, pressure ulcer prevention	CINAHL, pressure ulcers, nursing knowledge, attitudes, barriers, pressure ulcer prevention, Sweden, guidelines
Research Design	cost analysis, prospective cohort study	Descriptive, Cross-sectional study
Level of Evidence	ONS Level I	ONS Level II
Study Aim/Purpose	To determine the cost for prevention and treatment of pressure ulcers from a hospital perspective and to identify the least resource-intensive pressure ulcer prevention strategy.	To investigate attitudes among registered nurses and nursing assistants regarding pressure ulcer prevention, knowledge of pressure ulcer prevention and treatment and practice of risk assessment and documentation regarding pressure ulcers, perceived possibilities and barriers in pressure ulcer prevention and treatment.
Population Studied/Sample Size/Criteria/Power	Population: 2 large teaching hospitals in the Netherlands with opposing approaches to prevention. Patients must have grade 2 pressure ulcer or worse to be included. 1807 patients, > 18 years of age.	Sample: 230 registered nurses and nursing assistants in both municipality and hospital care settings randomly selected form a list, 67% response rate, criteria included permanent employment as nursing staff either half or full time.
Methods/Study Appraisal/Synthesis Methods	The purse value study to validate a pressure ulcer prediction rule in combination with a cost study including cost per intervention, cost of prevention, cost of treatment, cost per day and cost per patient per hospital receiving prevention or treatment.	A questionnaire was used for data collection, data were coded and entered into SPSS, analyzed using t-test, Mann-Whitney test and chi-square tests.

Primary Outcome Measures and Results	resource use, costs of preventative measures and treatment, and pressure ulcer incidence at both study facilities	Survey responses including attitudes to pressure ulcer prevention, knowledge about pressure ulcer prevention, preventative practice, possibilities and barriers in pressure ulcer prevention.
Author Conclusions/ Implications of Key Findings	Pressure ulcer prevention using a technical approach resulted in similar incidence rates as prevention through a human approach.	Evidence based methods for risk assessment are available but are not adopted and used in practice. This study highlighted the need for practice improvements in this area.
Strengths/ Limitations	Weaknesses: no data on efficacy of the TREATMENT of pressure ulcers due to no follow up, under-represented cost of treatment for grade IV pressure ulcers, possibility of differences between the 2 study populations. Strengths: none identified	Weaknesses: self administered questionnaire with 14 days to answer. Strengths: 67% response rate.
Funding Source	None Diclosed	Swedish Pharmaceutical Company
Comments	Good information related to the cost of prevention and treatment.	Want to contact the authors mentioned in the study to obtain their tool.

Article Title and Journal	The impact of pressure ulcer risk assessment on patient outcomes among hospitalized patients - Journal of Clinical Nursing	The impact of nurses' values on the prevention of pressure ulcers - The British Journal of Nursing	Competency and Educational Requirements: Perspectives of the Rural Emergency Nurse - The Journal of Emergency Nursing
Author/Year	Saleh, Anthony & Parboteeah, 2009	Samuriwo, 2010.	Bolin, Peck, Moore, & Ward-Smith, 2011
Database and Keywords	CINAHL, Braden score, clinical judgments, nurses, nursing, pressure ulcers, risk assessment scales	CINAHL, pressure ulcers, prevention, clinical practice, values	CINAHL, clinical competencies, educational requirements, rural emergency
Research Design	pre-test, post-test comparison	Grounded theory design	Experimental - survey
Level of Evidence	ONS Level I	ONS Level III	ONS Level II
Study Aim/Purpose	To determine whether use of a risk assessment scale reduces nosocomial pressure ulcers.	To ascertain what value nurses place on pressure ulcer prevention.	To capture the perspective of emergency department nurses in the rural setting before providing educational programs.
Population Studied/Sample Size/Criteria/Power	The study randomly allocated nine wards into three groups. A Braden score of >18 was necessary for inclusion. 198 total patients included in the study.	The participants in this study (n=16) were recruited from the non-acute adult medical wards of 14 hospitals of one NHS trust and a local university.	Sample included 33 nurses, representing 3 different rural emergency departments.
Methods/Study Appraisal/Synthesis Methods	Group A nurses received would management study day and Braden Scale training and were required to implement Braden Scale, Group B nurses were not required to implement a Braden	Data were gathered via semi-structured interviews, then transcribed and analyzed via Straussian grounded theory	A survey instrument was developed and tested for content validity and underwent expert panel review. The survey utilized a likert scale to assess perspectives on

Primary Outcome Measures and Results	Nosocomial pressure ulcer incidence rates	Two stage interview process to identify themes.	Results of indicators related to nursing education in the emergency department.
Author Conclusions/ Implications of Key Findings	Results questioned whether the use of a risk assessment scale is useful in reducing the incidence of nosocomial pressure ulcers. Clinical judgment Is valuable.	Results show that efforts to prevent pressure ulcers are often impeded by environmental factors like bed management, and the differing values placed on ulcer prevention by colleagues. It also shows that interventions to protect the skin of patients are often undertaken by healthcare assistants and students	Participants felt that maintaining clinical competency is important and ongoing clinical education should be mandatory.
Strengths/ Limitations	Weaknesses: ethical implications of not implementing the better known Norton Scale, patients not randomly allocated to each group. Strengths: non identified.	Weaknesses: study design using interviews. Strengths: ability to demonstrate the human component of pressure ulcer prevention.	Weaknesses: voluntary participation, poor generalizability.
Funding Source	None Disclosed	None disclosed	None Disclosed
Comments	Interesting data related to the use of risk assessment tools.	Takes into consideration the value that nurses place on preventative measures and barriers encountered.	Nurses want ongoing clinical education!

Article Title and Journal	Rural Perceptions of Continuing Professional Education - The Journal of Continuing Education in Nursing	Reducing Pressure Ulcers in Intensive Care Units at a Turkish Medical Center - The Journal of the Wound, Ostomy and Continence Nurses Society	Evaluation of the National Database of Nursing Quality Indicators (NDNQI) Training Program on Pressure Ulcers - The Journal of Continuing Education in Nursing
Author/Year	Jukkala, Henly & Lindeke, 2008.	Uzun, Aylaz & Karadag, 2009	Bergquist-Beringer, Davidson, Agosto, Linde, Abel, Spurling, Dunton & Christopher, 2009.
Database and Keywords	CINAHL, rural, nursing education, nursing, health care	CINAHL, pressure ulcers, nursing, education	CINAHL, pressure ulcers, nursing, training program, NDNQI
Research Design	Descriptive Study	Experimental Design, Prospective Study	Qualitative
Level of Evidence	ONS Level II	ONS Level I	ONS Level III
Study Aim/Purpose	To describe rural health care professionals' perceptions about professional isolation and the availability, accessibility, and relevance of continuing education.	To determine the impact of an educational intervention on the incidence of stage II pressure ulcers in adult ICU patients at a Turkish medical center.	To assess the effects of the NDNQI pressure ulcer training program on nursing staffs' ability to stage pressure ulcers and differentiate between hospital acquired and community acquire pressure ulcers.
Population Studied/Sample Size/Criteria/Power	Sample included 165 registered nurses and physicians providing health care at rural hospitals in two Midwestern states.	Sample included 186 critical care patients. 93 patients participated in the preintervention comparison group and 93 subjects were in the intervention group.	937 participants (18%) provided written evaluation comments.
Methods/Study Appraisal/Synthesis Methods	Participants answered five questions related to availability, accessibility, and relevance of continuing education and their sense of professional isolation.	Three forms were used: demographic and clinical data form, nursing intervention checklist, and Braden scale. Study investigators visited patients on a daily basis and collected data. Intervention consisted of 2 seminars training nurses regarding	The written evaluation comments were analyzed using content analysis and themes were identified.

Primary Outcome Measures and Results	Provider responses related to accessibility and relevance of continuing education.	The development of stage II pressure ulcers over time.	The emergence of themes in the written evaluation of the program.
Author Conclusions/ Implications of Key Findings	Continuing education specific to rural health care professionals is necessary and desirable.	A statistically significant different in pressure ulcer rates was observed in the intervention group (those nurses who attended the seminars). Education can be effective in reducing the rates of pressure ulcers.	Reviewers viewed the program positively and felt that the pictures of the wound staging were beneficial. The NDNQI pressure ulcer training program was effective in educating nursing staff on pressure ulcer identification
Strengths/ Limitations	Weaknesses: rural generalist practitioners with a higher willingness to take risks than some.	Weaknesses: focus on Stage II pressure ulcers, exclusion of patients admitted less than 48 hrs, short follow up time did not allow for measurement of adherence to the program.	Weaknesses: qualitative design
Funding Source	None Disclosed	None Disclosed	None Disclosed
Comments	Lack of access to CE is a barrier for recruitment and retention of rural health care staff.	Patient outcomes positively impacted by nursing education.	Interested in using this freely available program as part of my educational intervention!

Primary Outcome Measures and Results	The emergence of themes related to nursing values related to pressure ulcer care.	Content validity, expert panel review, item clarity evaluation	Pre and post educational program knowledge scores.
Author Conclusions/ Implications of Key Findings	Participants underwent a transition from placing a lower value to a higher value on pressure ulcer prevention, the integral point appeared to have been an encounter with a patient who had a high grade pressure ulcer.	The internal consistency of the instrument was 0.79 (Chronbach's Alpha). The instrument is sound and can be used to effectively assess attitudes towards pressure ulcer prevention in patient care, education and research.	The program did result in a statistically significant increase in nursing knowledge related to pressure ulcer prevention.
Strengths/ Limitations	Weaknesses: qualitative design	Weaknesses: convenience sampling, no more than three items included for each subscale	Strengths: intervention and control group. Weaknesses: self constructed knowledge test, exam conditions, attrition, turnover, long follow up period.
Funding Source	None Disclosed	None Disclosed	for Health Research and Development
Comments	Experience has a significant impact on nursing values.	Sound, brief instrument that has been rigorously tested.	A multifaceted intervention!!!

Article Title and Journal	Effects of Education and Experience on nurses' value of ulcer prevention - British Journal of Nursing	Pressure Ulcers: Development and psychometric evaluation of the Attitude towards Pressure Ulcer Prevention Instrument (APuP) - International Journal of Nursing Studies	The Effect of the SAFE or SORRY? Programme on Patient Safety Knowledge of Nurses in Hospitals and Nursing Homes: A Cluster Randomized Trial - International Journal of Nursing Studies
Author/Year	Samuriwo, 2010.	Beekman, Defloor, Demarre, Hecke & Vanderwee, 2010.	Betsie, Schoonhoven, Vloet, Mintjes, Borm, Koopmans & Achterberg, 2010.
Database and Keywords	CINAHL, pressure ulcer, prevention, values, experience, nurse education, value formation	CINAHL, nursing, pressure ulcers, prevention, psychometric, validity, reliability, attitude, instrument	CINAHL, education, hospitals, long term care, multicentre studies, nurses, safety management
Research Design	Qualitative, interviews	Prospective psychometric instrument validation study	Cluster Randomized Trial
Level of Evidence	ONS level III	ONS Level I	ONS Level I
Study Aim/Purpose	To determine the value that nurses place on pressure ulcer prevention.	To develop and psychometrically evaluate the APuP instrument.	To describe the effect of interactive and tailored education on the knowledge levels of nurses.
Population Studied/Sample Size/Criteria/Power	Sample included 16 participants who were interviewed. Participants were recruited from non-acute adult medical wards from one of 14 hospitals.	Convenience sample of 258 nurses and 291 nursing students from Belgium and the Netherlands. Data collected between 2/08 and 5/08.	Setting included 10 hospital wards and 10 nursing home wards and all nurses from participating wards were included. The study took place between 9/06 and 7/08.
Methods/Study Appraisal/Synthesis Methods	Themes related to values expressed by nurses in semi-structured interviews. Interpretation of themes was guided by Straussian grounded theory.	Following a literature review, a two phase prospective psychometric instrument validation study was completed. Phase 1 was instrument design and phase 2 included the psychometric evaluation.	A knowledge test related to nursing knowledge of prevention of pressure ulcers, urinary tract infections and falls was administered before and after a patient safety program initiative. The nurses in the intervention wards

Article Title and Journal	Improving Wound and Pressure Area Care in a Nursing Home - Nursing Standard	Quality Improvement Program to Reduce the Prevalence of Pressure Ulcers in an Intensive Care Unit - American Journal of Critical Care	Empowerment of the Nursing Assistant: Validating Their Important Role in Skin Care and Pressure Ulcer Prevention, and Demonstrating
Author/Year	Sprakes, 2010.	Elliot, McKinley & Fox, 2008.	Howe, L., 2008.
Database and Keywords	CINAHL, nursing homes, older people, pressure ulcers, wound care	CINAHL, quality improvement, pressure ulcers, nursing , training program	CINAHL, Nursing Assistants, Pressure Ulcer Prevention, Educational program
Research Design	Pre-test, post-test quasi experimental design	Quasi-experimental	Observational Study, Time Motion Study
Level of Evidence	ONS Level II	ONS Level II	ONS Level II
Study Aim/Purpose	To evaluate the improvement in nursing knowledge and confidence following training sessions and competency framework guidance.	To improve patients' outcomes by reducing the prevalence of pressure ulcers, and increasing the adoption of preventative strategies in an ICU.	Two fold: to effectively promote awareness of skin care and empower CNAs in their role with patient skin care and to measure caregiver time, job satisfaction, patient satisfaction, product cost comparison and patient skin outcomes.
Population Studied/Sample Size/Criteria/ Power	Sample included nursing home staff, four champions for the project were selected and guided the staff through the educational process.	Sample included 563 surveys of patient skin conducted over a 26-month period. Study conducted at a 14 bed adult general ICU in Australia.	Sample included 250 CAN staff involved in educational program.
Methods/Study Appraisal/ Synthesis Methods	Two theoretical training sessions were delivered by the authors and included one day on wound assessment and one day on pressure ulcer prevention and management. The nurses were then supported through the	The Waterlow Pressure Ulcer Risk Assessment Scale was utilized to calculate patient risk for pressure ulcer development. One on one training was performed regarding the use of the	An educational training program targeted different reading and comprehension levels and used a multi-faceted educational intervention to educate CNS on pressure ulcer

Primary Outcome Measures and Results	Pre and post educational program knowledge and confidence levels and pressure ulcer rates.	The rate of pressure ulcer development in the ICU in relationship to assessment scale risk score	Empowerment of CAN staff and incidence of pressure ulcers over time.
Author Conclusions/ Implications of Key Findings	The educational program increased knowledge, skills and competence in wound management.	The frequency of pressure ulcers showed a downward trend and the allocation of pressure relieving devices increased. The program was successful in reducing the prevalence of pressure ulcers among ICU patients.	The rate of pressure ulcers declined over time with the initiative. The educational program was considered a contributor to the improvement in patient outcomes.
Strengths/ Limitations	Weaknesses: health care assistance excluded from the project.	Strengths: data collected from all stages. Weaknesses: prevalence data, experts conducting study changed slightly throughout the study.	Weaknesses: study design
Funding Source	The Queen's Nursing Institute	None Disclosed	None Disclosed
Comments	Utilized champions to lead the educational initiatives. Good information!	Quality improvement projects can effectively decrease the incidence of pressure ulcers.	Used a multifaceted educational intervention. CNAs should be included in intervention as well?

Article Title and Journal	Multisite Web-Based Training in Using the Braden Scale to Predict Pressure Sore Risk - Advances in Skin and Wound Care	Reliability Testing of the National Database of Nursing Quality Indicators Pressure Ulcer Indicator - Journal of Nursing Care Quality	An Educational Model Fitted for Rural Municipalities - Nordic Journal of Nursing Research & Clinical Studies
Author/Year	Magnan & Maklebust, 2008.	Hart, Bergquist, Gajewski & Dunton, 2006.	Norbye, 2008.
Database and Keywords	CINAHL, pressure ulcers, Braden scale, education, training	CINAHL, nursing quality, pressure ulcer, reliability	CINAHL, nursing, education, rural, competency
Research Design	Pre and Post test Experimental Design	Experimental Design	Observational Study
Level of Evidence	ONS Level I	ONS Level I	ONS Level III
Study Aim/Purpose	To evaluate the effect of a web based Braden Scale training program module on the knowledge of nurses related to pressure ulcer risk assessment and prevention.	To determine the reliability of the NDNQI pressure ulcer indicator.	To develop a new model of education for implementing knowledge to nursing staff in a rural municipality.
Population Studied/Sample Size/Criteria/Power	Sample: 1391 registered nurses working at 3 medical centers in the Midwest.	Sample included 256 raters from 48 hospitals across the US. 33% of the hospitals were magnet, while 54% were teaching.	Sample included 20 participants in a rural municipality.
Methods/Study Appraisal/Synthesis Methods	The training module consisted of pressure ulcer assessment and prevention content and 5 case studies.	A web based test was designed and administered to 256 individuals at 48 hospitals to determine the reliability of the NDNQI pressure ulcer indicator.	The Tromsoe University College did a project to improve competency of nursing staff in a rural area. The "bottom-up" approach ensured the nursing staff mace key decisions regarding structure and

Primary Outcome Measures and Results	Nursing knowledge pre and post module intervention.	Interpreter reliability or K values.	Class attendance, competency
Author Conclusions/ Implications of Key Findings	Following training, nurses were able to correlate Braden scale level to patient risk 82.6% of the time. Knowledge of preventative interventions was high. In conclusion, the web based training alone does not ensure proper utilization of the Braden Scale - other strategies	Nurses can accurately differentiate pressure ulcers from other ulcerous wounds in web based photographs and reliably stage pressure ulcers and identify community versus nosocomial pressure	Through combining lectures, local workshops and seminars, nursing staff could attend a course designed specifically to meet their needs. The course addressed specific educational objectives and cost was kept to a
Strengths/ Limitations	Weaknesses: Non equivalent groups used in the study, no control for participant selection, no data obtained on participant years of experience or level of education	Weaknesses: Over representation of magnet hospitals, no rater to standard testing, use of Web images, 2 versions of the test.	Weaknesses: Non experimental design, small sample size
Funding Source	Care Tech Solutions	None Disclosed	None Disclosed
Comments	Reinforces the need for a multifaceted intervention and processes in place to ensure sustainable change.	Validation for the NDNQI indicator.	Addresses competency in the rural setting.

Article Title and Journal	Self-Efficacy-Based Training for Research Literature Appraisal: A Competency for Evidence-Based Practice - Journal for Nurses in Staff Development	Exploring Nursing Issues in Rural Hospitals - Journal of Nursing Administration	Evaluating Continuing Competency: A Challenge for Nursing - The Journal of Continuing Education in Nursing
Author/Year	Kiss, O'Malley, Hendrix, 2010.	Newhouse, 2005.	Allen, Lauchner, Bridges, Francis-Johnson, McBridge & Olivarez, 2008.
Database and Keywords	CINAHL, nursing training, evidence based practice, competency	CINAHL, rural, nursing	CINAHL, nursing, competency, confidence
Research Design	Pre-test, Post-test design	Qualitative	Literature Review Concept Analysis
Level of Evidence	ONS Level I	ONS Level III	ONS Level III
Study Aim/Purpose	[illegible] based intervention would improve nurses' knowledge and self-efficacy for effectively appraising quantitative research literature and to determine if there was indication of an intention for future use of appraisal skills aimed toward the incorporation of research	To explore the impact of legislative, strategic and organizational changes on nursing in rural hospitals in recent years.	To provide a framework for tracking knowledge, skills and attitudes throughout a career.
Population Studied/Sample Size/Criteria/ Power	Sample included 15 nurses who responded from recruitment flyers and agreed to participate.	Sample included a focus group of 11 nurse executives from rural hospitals.	Literature review, no sample
Methods/Study Appraisal/ Synthesis Methods	A pre-test, post-test design was used and included the variables of research knowledge, self-efficacy, attitude toward research, and intention to use research appraisal skills. The AKISS tool was the instrument used for	A focus group was conducted and themes from content analysis were grouped into 3 major categories including external environmental, internal organizational, and nursing infrastructure.	Walker and Avant (2004) seven step process for structured concept analysis.

Article Title and Journal	Barriers to Participation in Continuing Education Activities Among Rural and Remote Nurses - The Journal of Continuing Education in Nursing	Education Methods for Maintaining Competency in Low-Volume, High-Risk Procedures in the Rural Setting: Bridging the Theory to Practice Gap	Assessment of Nurses' Knowledge and Practice in Prevention and Management of Deep Tissue Injury and Stage I Pressure Ulcer - Journal of the Wound, Ostomy and Continence Nurses Society
Author/Year	Penz, D'Arcy, Stewart, Kosteniuk, Morgan & Smith, 2007.	Banks, Gilmartin & Fink, 2010.	Aydin & Karadag, 2010.
Database and Keywords	CINAHL, rural, nursing education, nursing, educational methods	CINAHL, nursing, education, competency	CINAHL, nursing, knowledge, pressure ulcers
Research Design	Data drawn from a national survey	Quasi-experimental, Pre-test, Post-test design	Descriptive Study
Level of Evidence	ONS Level III	ONS Level II	ONS Level II
Study Aim/Purpose	To examine the barriers to participation in continuing education activities that are perceived by rural and remote registered nurses in Canada.	To assess the efficacy of a multifaceted educational intervention on the retention of nursing knowledge related to central venous access devices care and maintenance.	To determine nurses' knowledge and usual practice in prevention and management of deep tissue injury and stage I pressure ulcers.
Population Studied/Sample Size/Criteria/ Power	national survey of 2832 participants consisting of randomly selected registered nurses living in rural areas of all Canadian provinces. (Qualitative portion) consisted of 2547 participants answering open ended	registered nurses. Nursing staff were divided up by department for data analysis purposes. Setting was a rural hospital in a Western state.	The sample included 243 nurses and was conducted at three different hospitals in Turkey. Nurses from neurology, orthopedics, physiotherapy, rehabilitation and ICU were chosen because theses patients have increased risk.
Methods/Study Appraisal/ Synthesis Methods	Data were extracted from a cross-sectional mail survey.	Nurses participated in a multifaceted educational intervention aimed at the care and prevention of CRBSI, education included skills lab, learning	A questionnaire was utilized to measure nursing knowledge and practice related to prevention of deep tissue injury and stage I pressure ulcers.

Primary Outcome Measures and Results	A qualitative analysis addressing "what are barriers?" and a quantitative analysis addressing characteristics of the individuals with perceived barriers.	Knowledge on a 25 item test pre and post intervention.	Level of knowledge and correlation between other demographic characteristics.
Author Conclusions/ Implications of Key Findings	Rural and remote registered nurses report moderately high participation in continuing educational offerings. Several barriers to participation exist and participation may be improved if these barriers are addressed.	A statistically significant increase in functional nursing knowledge was noted in the post-intervention period.	A statistically significant correlation was found between the percentage of correct answers and the level of nursing education, prior training with pressure ulcer management and participation in in-service training programs.
Strengths/ Limitations	Weaknesses: Inconsistencies with survey interpretation, cross-sectional research design makes accounting for reciprocal influences difficult.	Strengths: excellent response from nursing staff, educational methods well received by staff. Weaknesses: unknown reliability of tool, potential for historical effects, time commitment to the study making replication difficult	Weaknesses: descriptive design, no intervention to enhance outcomes.
Funding Source	None Disclosed	None Disclosed	None Disclosed
Comments	Relevant information related to barriers that rural nurses face.	Using this educational methodology and applying it to a different topic - pressure ulcers.	A large percentage of respondents reported no continuing education related to pressure ulcer care. One of my goals is to empower nurses to become responsible for their own knowledge enhancement.

Article Title and Journal	Pressure Ulcer Prevention: Utilizing Unlicensed Assistive Personnel - Critical Care Nursing Quality	Portfolios and the assessment of competence in nursing: A literature review - International Journal of Nursing Studies	The effectiveness of self-directed learning in health professions education: a systematic review - Medical Education
Author/Year	Walker, Van Sell & Kindred, 2010.	McCready, 2007.	Murad,Coto-Yglesias, Varkey, Prokop & Murad, 2010.
Database and Keywords	chronic, pressure ulcer prevention, assistive personnel, evidence-based practices, pressure	EBSCO, Assessment, Competence, Literature review, Nurse education, Portfolios, Reflection	EBSCO, self directed learning, nurses, education
Research Design	Literature Review	Literature Review	Systematic Review
Level of Evidence	ONS Level III	ONS Level III	ONS Level II
Study Aim/Purpose	To provide education to the RN regarding pressure ulcer prevention and best practice interventions including the use of unlicensed assistive personnel to help prevent pressure ulcers.	To explore the literature on the portfolio as a tool for the assessment of competence in nurse education.	To determine the effectiveness of SDL in improving learning outcomes in health professionals.
Population Studied/Sample Size/Criteria/Power	A comprehensive literature review was performed, the literature was current within the last 10 years and English language was a qualifier.	The literature review was conducted utilizing several databases, including CINAHL and MEDLINE as well as a hand search of relevant journals and documents.	The literature review was conducted using MEDLINE, EMBASE, ERIC and PsycINFO through to August 2009
Methods/Study Appraisal/Synthesis Methods	The key search terms included pressure ulcer, prevention, unlicensed assistive personnel, nursing assistant, theory of nursing knowledge, incidence, prevalence,	The search terms included: nurses in education, portfolios and assessment and competence.	Eligible studies were comparative and evaluated the effect of SDL interventions on learning outcomes in the domains of knowledge, skills and attitudes

Primary Outcome Measures and Results	Identification of best practice guidelines for pressure ulcer prevention.	The review divides the literature into content themes allowing synthesis of the subject looking at consistencies and differences, followed by a summary and key arguments relating to the next theme	Comparison and evaluation of self directed learning methodologies.
Author Conclusions/ Implications of Key Findings	Recommended best practice guidelines for pressure ulcer prevention were identified including assessment, pressure/positioning, moisture/skin care, nutrition & education.	The study findings highlight the importance of clear guidelines for portfolio construction and assessment, the importance of tri-partite support during portfolio development and guidelines for qualitative assessment. Where the portfolio process is well	When learners were involved in choosing learning resources, SDL was more effective. Advanced learners seemed to benefit more from SDL
Strengths/ Limitations	Weaknesses: non-experimental design	Strengths: a wide array of literature reviewed. Weaknesses: qualitative design.	Strengths: high methodological quality of studies reviewed. Weaknesses: unexplained heterogeneity, moderate pool of included studies, poor indexing.
Funding Source	None Disclosed	None Disclosed	in Medical Education (SDRME; USA)
Comments	This article identified several important best practice guidelines. In addition, a good reminder that assistive personnel are imperative in pressure ulcer prevention efforts.	Currents methods of skills assessment in nursing have produced suboptimal results. Perhaps the portfolio should be integrated into the competency assessment process?	The key is to involve learners in choosing learning resources and strategies to enable them to find the most appropriate resources to fit their individual learning styles as well as the overall learning objective.

Article Title and Journal	Competence in nursing practice: A controversial concept – A focused review of literature - Nurse Education Today	Professional Ethics is an Important Factor in Clinical Competency in Nursing - Nursing Ethics
Author/Year	Cowan, Normann & Coopamah, 2006.	Memarian, Salsali, Vanaki, Ahmadi& Hajizadeh, 2007.
Database and Keywords	CINAHL, competency, nursing practice	CINAHL, clinical competency, professional ethics
Research Design	Literature Review	Qualitative - Grounded Theory Approach
Level of Evidence	ONS Level III	ONS Level III
Study Aim/Purpose	To define the concept of competence with regard to nursing practice.	To study those factors that have an impact on the process of attaining clinical competency.
Population Studied/Sample Size/Criteria/ Power	publications on nursing competence were completed using Medline, The British Nursing Index, journals, books, abstracts, letters, conference proceedings, papers from meetings, theses, newspaper/newsletter reports, national and international nursing	A total of 36 clinical nurses, nurse educators, hospital managers and members of the Nursing Council in Tehran participated in this research.
Methods/Study Appraisal/ Synthesis Methods	Specific subject headings under which searches were made were: 'nursing competence' and 'nursing profession	Data were obtained by semi structured interviews. Personal factors and useful work experience were considered to be significant, based on knowledge and skills, ethical conduct, professional commitment, self-respect and respect for others, as well as from

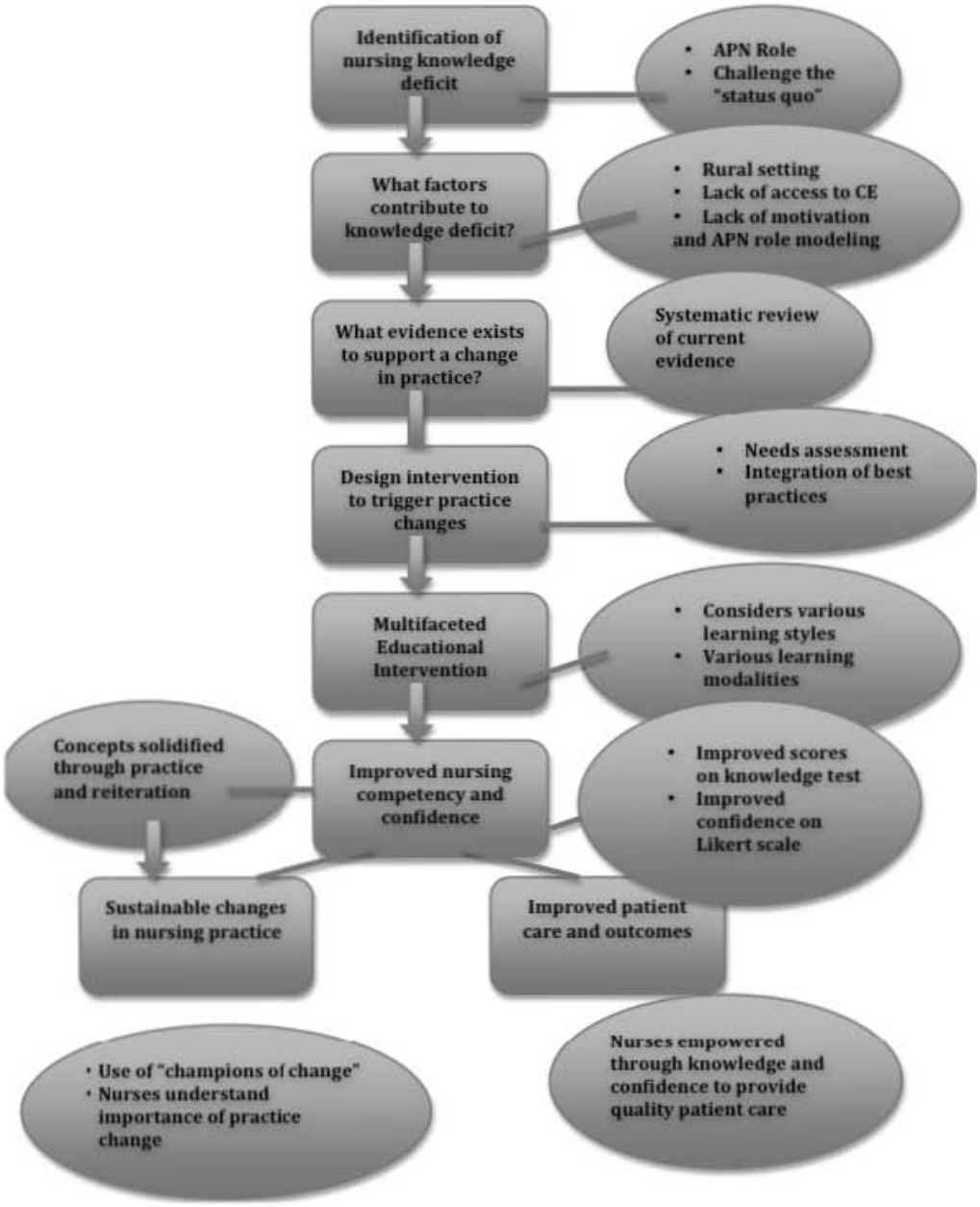
Primary Outcome Measures and Results	Identification of themes and definitions related to competency in nursing practice.	Identification of factors related to acquisition of clinical competency.
Author Conclusions/ Implications of Key Findings	There has been little consensus on the definition of competence with regard to nursing practice.	Personal and environmental factors affect clinical competency. Ethical persons are responsible and committed to their work, acquiring relevant work experience. A suitable work environment that is structured and ordered also encourages an ethical approach by nurses.
Strengths/ Limitations	Weaknesses: focused review of literature	Weaknesses: non-experimental design
Funding Source	None Disclosed	Research Deputy of Tarbiat Modares University in Tehran, Iran
Comments	Need for more research related to nursing competency and a standard working definition.	Competency is the process of empowering nurses to complete their duties successfully.

Primary Outcome Measures and Results	knowledge of research, self-efficacy, attitude toward research and intention to use research appraisal skills	The emergence of themes related to nursing issues in rural hospitals.	Literature review and concept analysis
Author Conclusions/ Implications of Key Findings	Nurses were better prepared to critically appraise the literature and through enhanced readiness, were more inclined to move toward evidence based practice.	Nurse executives in rural hospitals face several unique and notable issues and challenges, further study of the impact of policy and strategy decisions on rural nursing is necessary.	The learning environment for competency assurance involved the learner in assessment and accountability, provides practice-based learning opportunities and individualizes learning
Strengths/ Limitations	Weaknesses: small sample size, monomethod measurement bias, negative coefficient alpha on the AKISS tool.	Weaknesses: qualitative design, small sample size.	Weaknesses: non-experimental design
Funding Source	None Disclosed	None Disclosed	None Disclosed
Comments	Important because nurses must be taught to value evidence based practice and become self sufficient or change is not sustainable.	Describes the challenges faced by nurses practicing in the rural setting.	Identifies themes related to nursing competency and notes the importance of learner involvement in competency assurance.

Primary Outcome Measures and Results	Results of knowledge assessment, association between level of ICU experience and test scores	Low classification skills on the pretest, after the intervention, skills improved. Among qualified nurses there was no difference in results.	Identification of themes. 11 themes identified: physical impact, social impact, psychological effects, pressure ulcer symptoms, general health, healthcare professional-client relationship, need for versus effect of interventions, impact of others, financial impact, perceived etiology, and the need for knowledge.
Author Conclusions/ Implications of Key Findings	The educational program improved knowledge but knowledge returned to baseline in the post intervention period.	The classification skills of all nurses and nursing students increased by both learning methods, repetition is necessary.	There is evidence that pressure ulcers and pressure ulcer interventions have significant impact on HRQL and cause substantial burden to patients.
Strengths/ Limitations	Did not assess performance, patient outcomes, baseline test performed under observation	Limitations: convenience sampling, high attrition rate, intraobserver reliability, one dimensional photographs used for teaching	Strengths: international collaboration, mixed methodological review, quantitative measurement informs us about the physical effects of pain. Weaknesses: poor quality of RCTs, methods of administration poorly described, all RCTs excluded for this reason.
Funding Source	None Disclosed	None Disclosed	Smith and Nephew
Comments	Educational program for pressure ulcer prevention applied to ICU nurses. ? Contact authors for program.	Suggests that the use of cases rather than one dimensional photographs would be useful	A significant amount of literature reviewed with international collaboration.

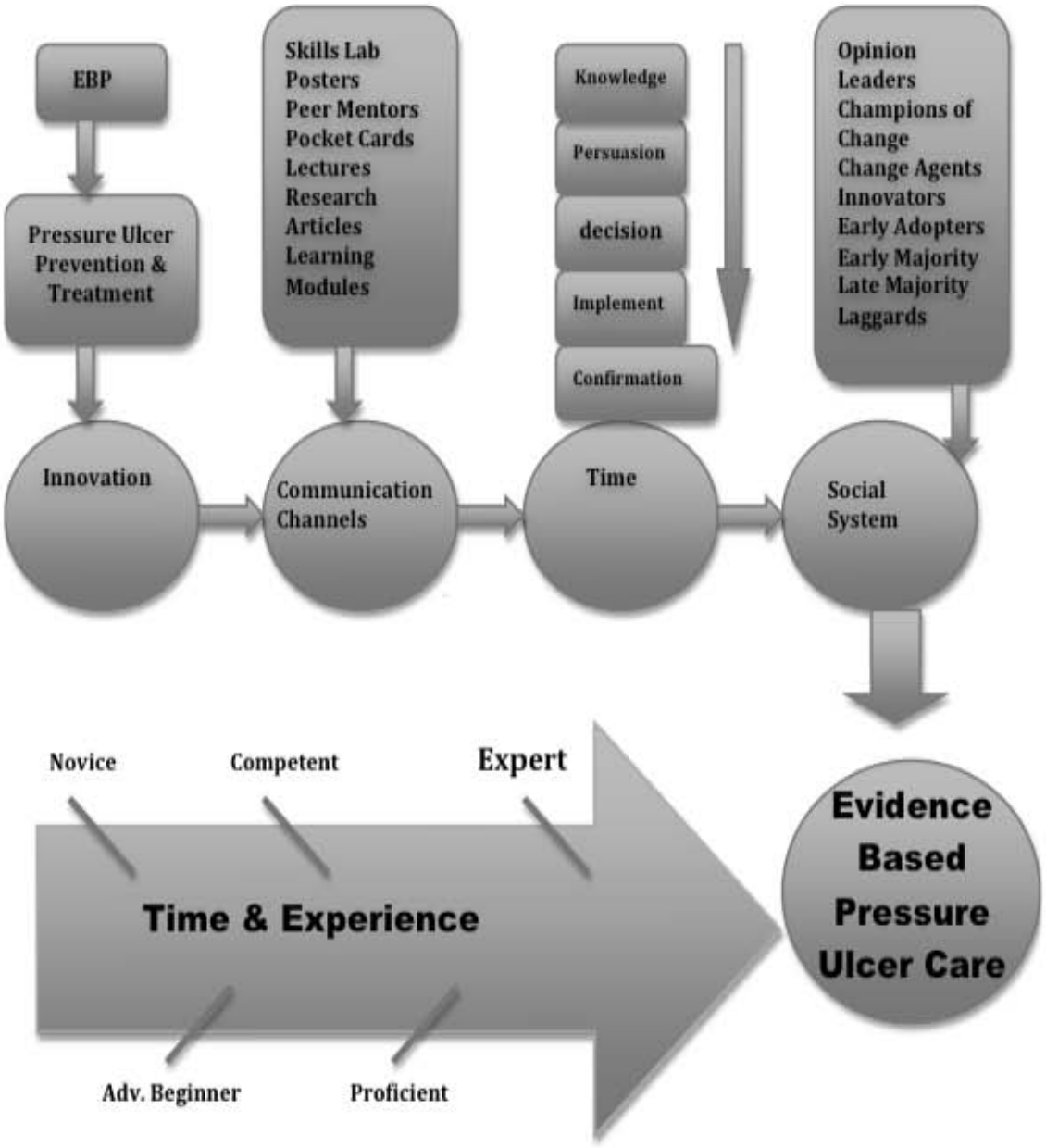
Appendix B

Logic Model



Appendix C

Conceptual Map



Appendix D

Pre-test

Theme 1: Aetiology and development

1. **Which statement is correct?**
   a. *Malnutrition causes pressure ulcers.*
   b. *A lack of oxygen causes pressure ulcers.**
   c. *Moisture causes pressure ulcers.*
2. **Extremely thin patients are more at risk of developing a pressure ulcer than obese patients.**
   a. *Correct. The contact area involved is small and thus the amount of pressure is higher.**
   b. *Incorrect. The pressure is less extensive because the body weight of those patients is lower than the body weight of obese patients.*
   c. *Incorrect. The risk of developing a vascular disorder is higher for obese patients. This increases the risk of developing a pressure ulcer.*
3. **What happens when a patient, sitting in bed in a semi-upright position (60°), slides down?**
   a. *Pressure increases when the skin sticks to the surface.*
   b. *Friction increases when the skin sticks to the surface.*
   c. *Shearing increases when the skin sticks to the surface.**
4. **Which statement is correct?**
   a. *Soap can dehydrate skin and thus the risk of pressure ulcers is increased.*
   b. *Moisture from urine, faeces, or wound drainage causes pressure ulcers.*
   c. *Shear is the force which occurs when the body slides and the skin sticks to the surface.**
5. **Which statement is correct?**
   a. *Recent weight loss which has brought a patient below his or her ideal weight, increases the risk of pressure ulcers.**
   b. *Very obese patients using medication that decreases the peripheral blood circulation are not at risk of developing pressure ulcers.*
   c. *Poor nutrition and age have no impact on tissue tolerance when the patient has a normal weight.*
6. **There is NO relationship between pressure ulcer risk and:**
   a. *Age*
   b. *Dehydration*
   c. *Hypertension**

Theme 2: Classification and observation

1. **Which statement is correct?**
   a. *A pressure ulcer extending down to the fascia is a grade 3 pressure ulcer.**
   b. *A pressure ulcer extending through the underlying fascia is a grade 3 pressure ulcer.*
   c. *A grade 3 pressure ulcer is always preceded by a grade 2 pressure ulcer.*
2. **Which statement is correct?**
   a. *A blister on a patient's heel is always a pressure ulcer of grade 2.*
   b. *All grades (1, 2, 3, and 4) of pressure ulcers involve loss of skin layers.*
   c. *When necrosis occurs, it is a grade 3 or a grade 4 pressure ulcer.**
3. **Which statement is correct?**
   a. *Friction or shear may occur when moving a patient in bed.**
   b. *A superficial lesion, preceded by non-blanchable erythema is probably a friction lesion.*
   c. *A kissing ulcer (copy lesion) is caused by pressure and shear.*
4. **In a sitting position, pressure ulcers are most likely to develop on:**
   a. *Pelvic area, elbow and heel.**
   b. *Knee, ankle and hip.*
   c. *Hip, shoulder and heel.*
5. **Which statement is correct?**
   a. *All patients at risk of pressure ulcers should have a systematic skin inspection once a week.*
   b. *The skin of patients seated in a chair, who cannot move themselves, should be inspected every two to three hours.*
   c. *The heels of patients who lie on a pressure redistributing surface should be observed minimum a day.**

Theme 3: Risk assessment

1. **Which statement is correct?**
   a. *Risk assessment tools identify all high risk patients in need of prevention.*
   b. *The use of risk assessment scales reduces the cost of prevention.*
   c. *A risk assessment scale may not accurately predict the risk of developing a pressure ulcer and should be combined with clinical judgement.**
2. **Which statement is correct?**
   a. *The risk of pressure ulcer development should be assessed daily in all nursing home patients.*
   b. *Absorbing pads should be placed under the patient to minimize the risk of pressure ulcer development.*
   c. *A patient with a history of pressure ulcers runs a higher risk of developing new pressure ulcers.**

Theme 4: Nutrition

1. **Which statement is correct?**
   a. *Malnutrition causes pressure ulcers.*
   b. *The use of nutritional supplements can replace expensive preventive measures.*
   c. *Optimizing nutrition can improve the patients general physical condition which may contribute to a reduction of the risk of pressure ulcers.**

Theme 5: Preventive measures to reduce the amount of pressure/shear

1. **The sitting position with the lowest contact pressure between the body and the seat is:**
   a. *An upright sitting position, with both feet resting on a footrest.*
   b. *An upright sitting position, with both feet resting on the floor.*
   c. *A backwards sitting position, with both legs resting on a footrest.**
2. **Which repositioning scheme reduces pressure ulcer risk the most?**
   a. *Supine position - side 90° lateral position - supine position - 90° lateral position - supine position - …*
   b. *Supine position - side 30° lateral position - side 30° lateral position- supine position - …**
   c. *Supine position - side 30° lateral position – sitting position - 30° lateral position –supine position - …*
3. **Which statement is correct?**
   a. *Patients who are able to change position while sitting should be taught to shift their weight minimum every 60 minutes while sitting in a chair.**
   b. *In a side lying position, the patient should be at a 90 degree angle with the bed.*
   c. *Shearing forces affect a patients sacrum maximally when the head of the bed is positioned at 30°.*
4. **If a patient is sliding down in a chair, the magnitude of pressure at the seat can be reduced the most by:**
   a. *A thick air cushion**
   b. *A donut shaped foam cushion*
   c. *A gel cushion*
5. **For a patient at risk of developing a pressure ulcer, a visco-elastic foam mattress…**
   a. *Reduces the pressure sufficiently and does not need to be combined with repositioning.*
   b. *Has to be combined with repositioning every 2 hours.*
   c. *Has to be combined with repositioning every 4 hours.**
6. **A disadvantage of a water mattress is:**
   a. *Shear at the buttocks increases.*
   b. *Pressure at the heels increases.*
   c. *Spontaneous small body movements are reduced.**
7. **When a patient is lying on a pressure reducing foam mattress…**
   a. *Elevation of the heels is not necessary.*
   b. *Elevation of the heels is important.**
   c. *He or she should be checked for "bottoming out" at least twice a day.*

Theme 6: Preventive measures to reduce the duration of pressure/shear

1. **Repositioning is an accurate preventive method because…**
   a. *The magnitude of pressure and shear will be reduced.*
   b. *The amount and the duration of pressure and shear will be reduced.*
   c. *The duration of pressure and shear will be reduced.**
2. **Fewer patients will develop a pressure ulcer if …**
   a. *Food supplements are provided.*
   b. *The areas at risk are massaged.*
   c. *Patients are mobilized.**
3. **Which statement is correct?**
   a. *Patient's at risk lying on a non pressure reducing foam mattress should be repositioned every two hours.*
   b. *Patient's at risk lying on an alternating air mattress should be repositioned every 4 hours.*
   c. *Patient's at risk lying on a visco- elastic foam mattress should be repositioned every 2 hours.*
4. **When a patient is lying on an alternating pressure air mattress, the prevention of heel pressure ulcers includes:**
   a. *No specific preventive measures.*
   b. *A pressure reducing cushion under the heels.*
   c. *A cushion under the lower legs elevating the heels.**
5. **If a bedridden patient cannot be repositioned, the most appropriate pressure ulcer prevention is:**
   a. *A pressure redistributing foam mattress.*
   b. *An alternating pressure air mattress.**
   c. *Local treatment of the risk areas with zinc oxide paste.*

[Beeckman et al. (2010)]

Confidence Assessment:

1. **Rate your current level of confidence in staging pressure ulcers?**

   1 2 3 4 5
   least confident most confident

2. **Rate your current level of confidence in caring for patients with stage 1 pressure ulcers?**

   1 2 3 4 5
   least confident most confident

3. **Rate your current level of confidence in caring for patients with stage 2 pressure ulcers?**

   1 2 3 4 5
   least confident most confident

4. **Rate your current level of confidence in caring for patients with stage 3 or unstageable pressure ulcers?**

   1 2 3 4 5
   least confident most confident

5. **Rate your current level of confidence in identifying those patients at risk for the development of pressure ulcers?**

   1 2 3 4 5
   least confident most confident

6. **Please rate your current level of confidence that you are knowledge related to the prevention of pressure ulcers in at risk patients?**

   1 2 3 4 5
   least confident most confident

Demographic Questions:

1. What is your age in years?

2. How many years of experience in nursing do you have?

3. What is your specialty area?
    1. Perioperative (pre-op, OR, PACU)
    2. ED
    3. ICU
    4. Med/Surg
    5. OB
    6. Nursery
    7. Oncology
    8. Home care
    9. Outpatient
    10. Administration
    11. Other, please specify

4. What is your gender?

    1. Female 2. Male

Learning Preferences Questions:

1. Which educational method was most useful in your acquisition of knowledge in regards to pressure ulcer prevention and treatment?
   Rate from 1-6, 1= most helpful, 6= least helpful or 7 = did not attend
   ___ Self Study Module
   ___ Journal Club
   ___ Didactic Lecture
   ___ Educational Poster
   ___ Skills Lab

Post-test

Theme 1: Aetiology and development

1. **Which statement is correct?**
   a. *Malnutrition causes pressure ulcers.*
   b. *A lack of oxygen causes pressure ulcers.**
   c. *Moisture causes pressure ulcers.*
2. **Extremely thin patients are more at risk of developing a pressure ulcer than obese patients.**
   a. *Correct. The contact area involved is small and thus the amount of pressure is higher.**
   b. *Incorrect. The pressure is less extensive because the body weight of those patients is lower than the body weight of obese patients.*
   c. *Incorrect. The risk of developing a vascular disorder is higher for obese patients. This increases the risk of developing a pressure ulcer.*
3. **What happens when a patient, sitting in bed in a semi-upright position (60°), slides down?**
   a. *Pressure increases when the skin sticks to the surface.*
   b. *Friction increases when the skin sticks to the surface.*
   c. *Shearing increases when the skin sticks to the surface.**
4. **Which statement is correct?**
   a. *Soap can dehydrate skin and thus the risk of pressure ulcers is increased.*
   b. *Moisture from urine, faeces, or wound drainage causes pressure ulcers.*
   c. *Shear is the force which occurs when the body slides and the skin sticks to the surface.**
5. **Which statement is correct?**
   a. *Recent weight loss which has brought a patient below his or her ideal weight, increases the risk of pressure ulcers.**
   b. *Very obese patients using medication that decreases the peripheral blood circulation are not at risk of developing pressure ulcers.*
   c. *Poor nutrition and age have no impact on tissue tolerance when the patient has a normal weight.*
6. **There is NO relationship between pressure ulcer risk and:**
   a. *Age*
   b. *Dehydration*
   c. *Hypertension**

Theme 2: Classification and observation

1. **Which statement is correct?**
   a. *A pressure ulcer extending down to the fascia is a grade 3 pressure ulcer.**
   b. *A pressure ulcer extending through the underlying fascia is a grade 3 pressure ulcer.*
   c. *A grade 3 pressure ulcer is always preceded by a grade 2 pressure ulcer.*
2. **Which statement is correct?**
   a. *A blister on a patient's heel is always a pressure ulcer of grade 2.*
   b. *All grades (1, 2, 3, and 4) of pressure ulcers involve loss of skin layers.*
   c. *When necrosis occurs, it is a grade 3 or a grade 4 pressure ulcer.**
3. **Which statement is correct?**
   a. *Friction or shear may occur when moving a patient in bed.**
   b. *A superficial lesion, preceded by non-blanchable erythema is probably a friction lesion.*
   c. *A kissing ulcer (copy lesion) is caused by pressure and shear.*
4. **In a sitting position, pressure ulcers are most likely to develop on:**
   a. *Pelvic area, elbow and heel.**
   b. *Knee, ankle and hip.*
   c. *Hip, shoulder and heel.*
5. **Which statement is correct?**
   a. *All patients at risk of pressure ulcers should have a systematic skin inspection once a week.*
   b. *The skin of patients seated in a chair, who cannot move themselves, should be inspected every two to three hours.*
   c. *The heels of patients who lie on a pressure redistributing surface should be observed minimum a day.**

Theme 3: Risk assessment

1. **Which statement is correct?**
   a. *Risk assessment tools identify all high risk patients in need of prevention.*
   b. *The use of risk assessment scales reduces the cost of prevention.*
   c. *A risk assessment scale may not accurately predict the risk of developing a pressure ulcer and should be combined with clinical judgement.**
2. **Which statement is correct?**
   a. *The risk of pressure ulcer development should be assessed daily in all nursing home patients.*
   b. *Absorbing pads should be placed under the patient to minimize the risk of pressure ulcer development.*
   c. *A patient with a history of pressure ulcers runs a higher risk of developing new pressure ulcers.**

Theme 4: Nutrition

1. **Which statement is correct?**
   a. *Malnutrition causes pressure ulcers.*
   b. *The use of nutritional supplements can replace expensive preventive measures.*
   c. *Optimizing nutrition can improve the patients general physical condition which may contribute to a reduction of the risk of pressure ulcers.**

Theme 5: Preventive measures to reduce the amount of pressure/shear

1. **The sitting position with the lowest contact pressure between the body and the seat is:**
   a. *An upright sitting position, with both feet resting on a footrest.*
   b. *An upright sitting position, with both feet resting on the floor.*
   c. *A backwards sitting position, with both legs resting on a footrest.**
2. **Which repositioning scheme reduces pressure ulcer risk the most?**
   a. *Supine position - side 90° lateral position - supine position - 90° lateral position - supine position - …*
   b. *Supine position - side 30° lateral position - side 30° lateral position- supine position - …**
   c. *Supine position - side 30° lateral position – sitting position - 30° lateral position –supine position - …*
3. **Which statement is correct?**
   a. *Patients who are able to change position while sitting should be taught to shift their weight minimum every 60 minutes while sitting in a chair.**
   b. *In a side lying position, the patient should be at a 90 degree angle with the bed.*
   c. *Shearing forces affect a patients sacrum maximally when the head of the bed is positioned at 30°.*
4. **If a patient is sliding down in a chair, the magnitude of pressure at the seat can be reduced the most by:**
   a. *A thick air cushion**
   b. *A donut shaped foam cushion*
   c. *A gel cushion*
5. **For a patient at risk of developing a pressure ulcer, a visco-elastic foam mattress…**
   a. *Reduces the pressure sufficiently and does not need to be combined with repositioning.*
   b. *Has to be combined with repositioning every 2 hours.*
   c. *Has to be combined with repositioning every 4 hours.**
6. **A disadvantage of a water mattress is:**
   a. *Shear at the buttocks increases.*
   b. *Pressure at the heels increases.*
   c. *Spontaneous small body movements are reduced.**
7. **When a patient is lying on a pressure reducing foam mattress…**
   a. *Elevation of the heels is not necessary.*
   b. *Elevation of the heels is important.**
   c. *He or she should be checked for "bottoming out" at least twice a day.*

Theme 6: Preventive measures to reduce the duration of pressure/shear

1. **Repositioning is an accurate preventive method because…**
   a. *The magnitude of pressure and shear will be reduced.*
   b. *The amount and the duration of pressure and shear will be reduced.*
   c. *The duration of pressure and shear will be reduced.**
2. **Fewer patients will develop a pressure ulcer if …**
   a. *Food supplements are provided.*
   b. *The areas at risk are massaged.*
   c. *Patients are mobilized.**
3. **Which statement is correct?**
   a. *Patient's at risk lying on a non pressure reducing foam mattress should be repositioned every two hours.*
   b. *Patient's at risk lying on an alternating air mattress should be repositioned every 4 hours.*
   c. *Patient's at risk lying on a visco- elastic foam mattress should be repositioned every 2 hours.*
4. **When a patient is lying on an alternating pressure air mattress, the prevention of heel pressure ulcers includes:**
   a. *No specific preventive measures.*
   b. *A pressure reducing cushion under the heels.*
   c. *A cushion under the lower legs elevating the heels.**
5. **If a bedridden patient cannot be repositioned, the most appropriate pressure ulcer prevention is:**
   a. *A pressure redistributing foam mattress.*
   b. *An alternating pressure air mattress.**
   c. *Local treatment of the risk areas with zinc oxide paste.*

[Beeckman et al. (2010)]

Confidence Assessment:

7. **Rate your current level of confidence in staging pressure ulcers?**

   1 2 3 4 5
   least confident most confident

8. **Rate your current level of confidence in caring for patients with stage 1 pressure ulcers?**

   1 2 3 4 5
   least confident most confident

9. **Rate your current level of confidence in caring for patients with stage 2 pressure ulcers?**

   1 2 3 4 5
   least confident most confident

10. **Rate your current level of confidence in caring for patients with stage 3 or unstageable pressure ulcers?**

    1 2 3 4 5
    least confident most confident

11. **Rate your current level of confidence in identifying those patients at risk for the development of pressure ulcers?**

    1 2 3 4 5
    least confident most confident

12. **Please rate your current level of confidence that you are knowledge related to the prevention of pressure ulcers in at risk patients?**

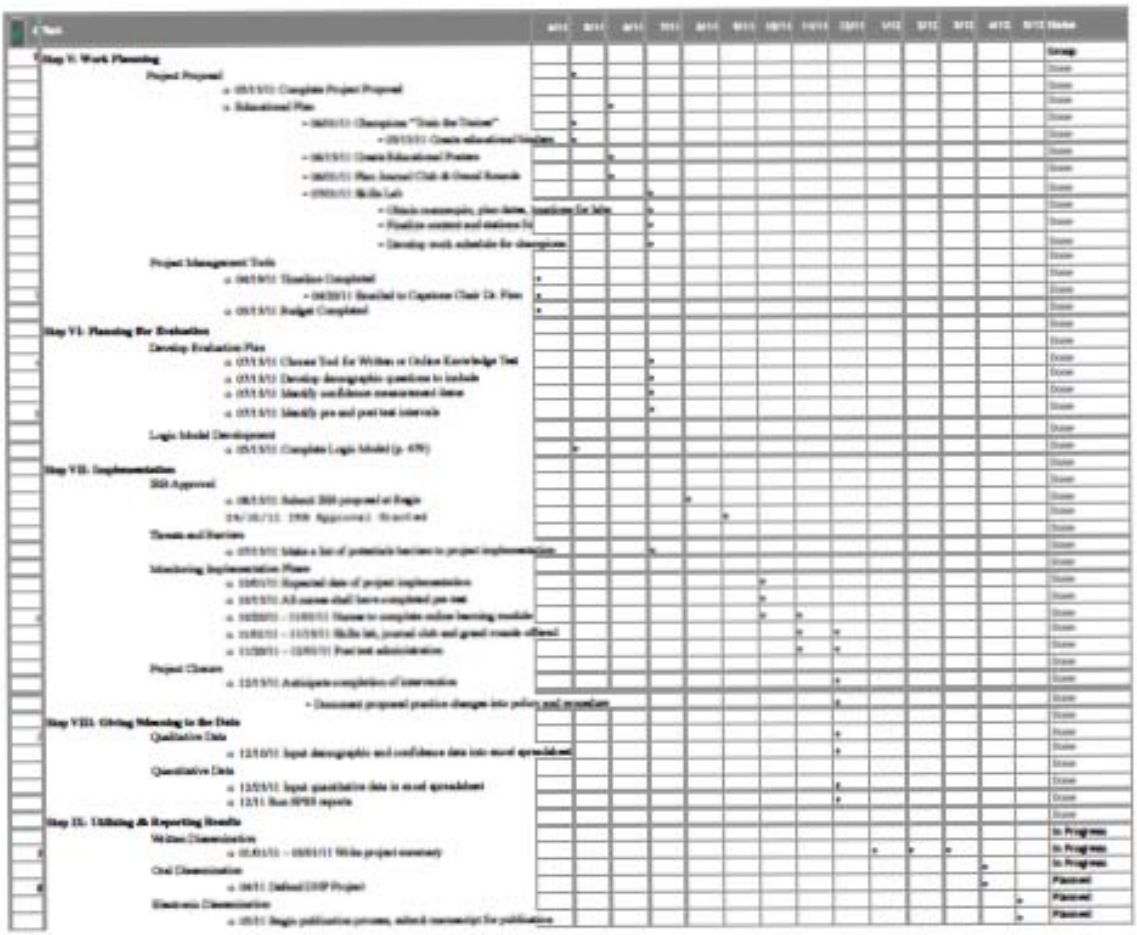
    1 2 3 4 5
    least confident most confident

Learning Preferences Questions:

2. Which educational method was most useful in your acquisition of knowledge in regards to pressure ulcer prevention and treatment?
   Rate from 1-6, 1= most helpful, 6= least helpful or 7 = did not attend
   ___ Self Study Module
   ___ Journal Club
   ___ Didactic Lecture
   ___ Educational Poster
   ___ Skills Lab

Appendix E

Timeframe



Appendix F

Budget and Resources

Equipment for the skills lab:

Pat Pressure Ulcer Mannequin: $390 (money donated from education budget at Gordon Memorial Hospital)

Sample dressings: $120 (sample dressing donated from education budget at Gordon Memorial Hospital)

Nursing time (donated paid time from each facility) estimated at $20/hr x 55 participants = $1100

Poster materials including poster boards and color paper: $75 (paid my myself)

Copier paper for handouts: $20.00

Total costs - $1705 (estimated)

Appendix G

IRB Approval Letter

REGIS UNIVERSITY

Academic Affairs
Academic Grants

3333 Regis Boulevard, H-4
Denver, Colorado 80221-1099

303-458-4205
303-964-0647 FAX
www.regis.edu

IRB – REGIS UNIVERSITY

September 30, 2011

Cassie Banks
120 N Pine Street
Gordon, NE 69343

RE: IRB #: 11-264

Dear Cassie:

Your application to the Regis IRB for your project "An Evidence Based Educational Intervention to Enhance Nursing Knowledge of Pressure Ulcer Prevention and Treatment Guidelines" was approved as exempt on September 30, 2011.

The designation of "exempt," means no further IRB review of this project, as it is currently designed, is needed.

If changes are made in the research plan that significantly alter the involvement of human subjects from that which was approved in the named application, the new research plan must be resubmitted to the Regis IRB for approval.

Sincerely,

Daniel Roysden, Ph.D.
Chair, Institutional Review Board

cc: Dr. Cris Finn
Dr. Marcia Gilbert

Appendix H

CITI Training Certificate

CITI Collaborative Institutional Training Initiative

Human Research Curriculum Completion Report
Printed on 6/6/2011

Learner: Cassie Banks (username: cbanks1217)
Institution: Regis University
Contact Information 120 N Pine Street
Gordon, NE 69343 USA
Department: Nursing
Phone: 719-640-1229
Email: thors503@regis.edu

Social Behavioral Research Investigators and Key Personnel:

Stage 1. Basic Course Passed on 06/06/11 (Ref # 6136884)

Required Modules	Date Completed	
Introduction	06/06/11	no quiz
History and Ethical Principles - SBR	06/06/11	4/4 (100%)
The Regulations and The Social and Behavioral Sciences - SBR	06/06/11	4/5 (80%)
Assessing Risk in Social and Behavioral Sciences - SBR	06/06/11	4/5 (80%)
Informed Consent - SBR	06/06/11	5/5 (100%)
Privacy and Confidentiality - SBR	06/06/11	5/5 (100%)
Regis University	06/06/11	no quiz

For this Completion Report to be valid, the learner listed above must be affiliated with a CITI participating institution. Falsified information and unauthorized use of the CITI course site is unethical, and may be considered scientific misconduct by your institution.

Paul Braunschweiger Ph.D.
Professor, University of Miami
Director Office of Research Education
CITI Course Coordinator

Return

Appendix I

Facility Letters of Support

Gordon Memorial Health Services

Gordon Memorial Hospital
300 East 8th
Gordon, NE 69343
Phone: (308) 282-0401
Fax: (308) 282-0431

Gordon Clinic
807 North Ash
Gordon, NE 69343
Phone: (308) 282-1442
Fax: (308) 282-1428

Rushville Clinic
P. O. Box 750
Rushville, NE 69360
Phone: (308) 327-2757
Fax: (308) 327-2070

Gordon Countryside Care
500 East 10th
Gordon, NE 69343
Phone: (308) 282-0806
Fax: (308) 282-0251

August 9, 2011

Regis University Institutional Review Board
Denver, Colorado

To Whom It May Concern:

Cassie Banks is a Regis University doctoral candidate conducting research and education at the Gordon Memorial Hospital in Gordon, Nebraska. We are a small Critical Access Hospital and as such, we do not have an Institutional Review Board.

This letter will serve as approval for Cassie Banks to conduct proposed educational intervention with the nursing staff of Gordon Memorial Hospital.

Sincerely,

Kathie King

Kathie King, R.N. B.S.N.
Director of Clinical Quality
Gordon Memorial Hospital

Pioneer Manor Nursing Home ~ Marie Dreyer, DON

"And the greatest of these is love." Corinthians: 13:13

Phone: 308 638-4483 Fax: 308 368-7385

August 17, 2011

Regis University Institutional Review Board
Denver, Colorado

To Whom It May Concern:

Cassie Banks is a Regis University Doctoral candidate conducting research and education at Pioneer Manor Nursing Home in Hay Springs, Nebraska. Pioneer Manor is a skilled nursing facility caring for 57 skilled patients. We do not have an Institutional Review Board.

This letter serves as approval for Cassie Banks to conduct training and research with staff employed at Pioneer Manor. She will conduct educational interventions and programs for nursing staff.

Sincerely,
Marie Dreyer RNc

Marie Dreyer RNc
Director of Nursing
Pioneer Manor Nursing Home