

REVIEWS

Evaluation of evidence-based nursing education of hospital acquired pressure injury prevention in clinical practice: An integrative review

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ABSTRACT

Background and objective: There are 2.5 million Americans affected by hospital-acquired pressure injuries (HAPI) annually. The objective of this study was to review and synthesize the evidence on competency-based education of interventions to prevent HAPIs and to improve the knowledge-base of nursing to guide quality and safety initiatives for patients.

Methods: A total of 30 articles met the inclusion and exclusion criteria. They were reviewed, and the selected articles focused into three main areas: nurse knowledge and education, HAPI prevention improvement, and competency. These articles were examined to comprise a review on the studies that provided the most relevant synchronized data concerning pressure ulcers and competency-based education.

Results: Two themes developed during the literature search and analysis of the selected articles. The first theme focused on nurse education programs for the prevention and identification of HAPI, and the second was the need for nurse knowledge and competency in the prevention of HAPI.

Conclusions: Appraisal of the literature showed that various HAPI education programs have improved nurses' knowledge and competency, and decreased HAPI occurrences. Future research should focus on identifying and reinforcing standardized professional competency-based education to create a culture of success, and ensure consistently high quality care and safe outcomes for patients.

Key Words: Evidence-based nursing, Hospital acquired pressure injury, Clinical practice

1. INTRODUCTION

Each year, 2.5 million Americans are affected and 60,000 deaths are contributed by hospital acquired pressure injuries (HAPI). It is an enormous financial burden on patients, families, tax payers, and the United States government, and an economic cost of 11 billion dollars annually.^[1] Additionally, more than 17,000 pressure injury related lawsuits are filed each year in the United States, second only to health

care associated wrongful death.^[2] The National Pressure Ulcer Advisory Panel (NPUAP) redefined the definition of a pressure ulcer to a pressure injury on April 13, 2016^[3] as: "localized damage to the skin and/or underlying soft tissue usually over a bony prominence or related to a medical or other device".^[3]

Hospital acquired pressure injury is one of the hospital acquired conditions (HACs), and a significant patient safety

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issue for hospitalized patients by increasing hospital stay, morbidity rates and mortality rates.^[4] The Center for Medicare and Medicaid Services (CMS) selected ten categories of hospital acquired conditions for a new policy- nonpayment rules, beginning on October 1, 2008. Hospitals no longer receive additional payment for cases in which one of the selected conditions was not present on admission (POA), but developed while the patient was hospitalized.^[5,6]

Over the past decades, the U.S. health care system has invested a significant amount of time, effort, and research in preventing HAPI in order to meet constant changes in health care and increased regulatory requirements. HAPIs remain a challenge for health care clinicians, organizations and health care systems. Prevention is a key. Nurses are on the front lines and are at the forefront of care to positively impact HAPI prevention. The aim of this integrative review is to summarize the relevant literature and evidence on preventing HAPI interventions for improving the nursing knowledge and patient outcomes.

2. METHODS

2.1 Search strategy

A literature search in the databases of PubMed, Embase, and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) was performed by the first author (M.H.) to investigate interventions to prevent pressure injuries in nursing education with the goal of improving nurses' knowledge and clinical competency by evaluating the evidence in reducing HAPI occurrence. The search included pressure injury concepts. The search term "pressure ulcer" was used in place of "pressure injury" because the new terminology has not yet caught up with research and practice. The controlled vocabularies of key search terms on following Medical Subject Headings (MeSH) were used: "pressure ulcer", "decubitus ulcer", and "competency-based education". The search was supplemented with "nursing education", "nurse education programs", "pressure ulcers" and "hospital-acquired pressure ulcer intervention" as free text words. The Boolean indicator "AND" was used to select studies that applied to both "pressure ulcer" and "competency-based education". All terms were tailored to the thesaurus of each database. Local unpublished surveys, unpublished reports, and academic theses were not included.

2.2 Eligibility criteria

The search conducted was limited to peer-reviewed research articles with a time period published of 2005 to 2016. Searched articles had to be published in English, have an abstract available and take place in acute care hospital settings. Search criteria were limited to populations who were adult

(defined as being over 18 years of age), related to preventing pressure injury and include nursing education interventions, with nonexperimental studies, or qualitative studies and outcomes presenting evidence to reduce HAPIs. The search excluded articles that were not published in English, were abstracts only, or included populations who were younger than 18 years of age.

2.3 Study quality assessment

The first author performed a two-step review process. The first review process was done to confirm that the studies met the inclusion and exclusion criteria. A second review process was done to complete individual grading of the study assessment according to standard quality and strength measures specified.

3. RESULTS

3.1 Search results

Our search initially identified 678 articles, a total of 114 articles in full-text, and of these, 84 studies were excluded due to lack of relevance to acute clinical practice settings or other eligible criteria. The remaining 30 studies met the inclusion and exclusion criteria. Figure 1 provides a summary of the search strategy employed. The articles were critically examined to comprise the state of the evidence on data concerning pressure injuries and competency-based education (CBE).

The study quality assessment was processed through the Johns Hopkins University (JHU) Research and Non-Research Evidence Appraisal Tool.^[6] The tool was used to categorize and evaluate the level and quality of the evidence collected during the search. The level of the research evidence was graded as Level I (experimental study and meta-analysis of randomized controlled trials [RCTs]), Level II (quasi-experimental study), or Level III (nonexperimental study, qualitative study, or meta-synthesis).

Assessment of the articles found that most of the articles searched were in level III. Twenty-seven of the 30 articles were classified as level III- nonexperimental studies or qualitative studies, two articles were classified as level IV because they were the opinion of an expert, and the remaining article was classified as level V because experts were recommending clinical guidelines. The quality of the evidence was also rated using the JHU Evidence Appraisal Tool as the following rating scale: A = high quality, B = good quality, and C = low-quality data or major flaws.

Of the 30 search articles, nine of the articles were rated as "A" level or "high" quality. The Evidence Appraisal Tool defines "high" quality data as data that is consistent with generalizable results. The data collected were the result of a

sufficient sample size for the study design, had adequate controls, drew definitive conclusions, and provided consistent recommendations based on comprehensive literature reviews including thorough reference to scientific evidence.

The remaining 21 articles collected in the data search were rated as “B” level, or “good” quality articles. The Evidence

Appraisal Tool evaluates this data as data with reasonably consistent results derived from a sufficient sample size for the study design. The data provided some control in the study, and came to fairly definitive conclusions. The data provided reasonably consistent recommendations based on a relatively comprehensive literature review that included some reference to scientific evidence.

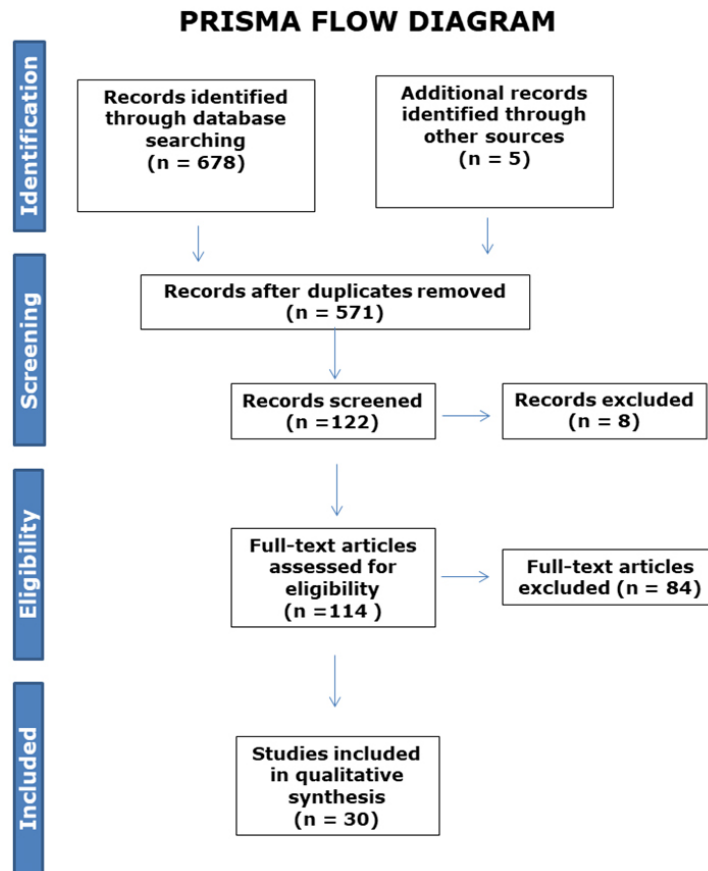


Figure 1. Prisma flow diagram

From: Moher D, et al. (2009). Preferred reporting items for systematic reviews and meta-analysis: the prisma statement. *Plos Med.*

3.2 Aggregate data synthesis

Eleven of the studies were conducted in the US (37%), three in the United Kingdom, two in Canada, two in Brazil, and one each in Argentina, Belgium and the Netherlands, Egypt, Germany, Ireland, Italy, Singapore, Sweden, and Turkey. Two of the studies included data gathered from multiple countries.

The selected articles focused on three main areas: nurse knowledge and education, HAPI prevention improvement, and competency. A majority of the articles (19) focused on nurse knowledge and education, with quality improvement being next in the quantity of articles available (8). Finally, there were two articles focused on nurse competency and

one meta-analysis on HAPI prevention.

Six of the studies were conducted using sample sizes that had sample sizes greater than 500 participants (i.e., $n > 500$). Eight studies had a sample size between $n = 101$ and $n = 499$, and seven studies had a sample size less than or equal to 100 participants ($n < 100$). Seven of the remaining studies listed their sample size regarding hospitals or units participating in the study, and two articles were classified as expert opinions and as a result, did not provide a sample size.

3.3 Nurse education programs for the prevention and identification of HAPI

In this literature review, all types of interventions had been tested in preventing HAPI and improving patient safety and

quality care. Interventions of HAPI prevention played a pivotal role on early identification of patients at risk to develop sores and nurses' knowledge of HAPI prevention was crucial to the evaluation, treatment of risk factors,^[7] and mediation of preventive care.^[8] HAPI guidelines were critical evidence-based tools for informing the care process at health care facilities.

4. DISCUSSION

4.1 Synthesizing the evidence

Two themes developed during the literature search and analysis of the selected articles. The first theme focused on nurse education programs for the prevention and identification of HAPIs, and the second was the need for not just nurse knowledge, but nurse competency in the prevention of HAPI. Appraisal of the literature showed that various HAPI education programs have improved nurses' knowledge and competency, and decreased HAPI occurrences. Future research should focus on identifying and reinforcing standardized professional CBE to create a culture of success, and ensure high-quality care including consistent delivery of safety outcomes for patients.

4.2 Strengths

The most significant strength of the evidence was the variety of interventions developed based mostly on the Center for Disease Control and Prevention (CDC) guidelines and their successes. Many studies acknowledged that nurses had a knowledge-deficit for preventing HAPI; yet effective evidence interventions corrected this problem. The studies investigated improving nurse knowledge to prevent HAPIs through education programs, and several articles advocated that these programs were tied to evaluating nurse competency. All education programs in the studies had some success. A stronger competency-based education program for the prevention of HAPI could be developed by combining the best intervention and education strategies together into a program that addresses HAPI prevention worldwide.

Another strength of the evidence was the geographic diversity represented within the studies. The studies were conducted in 14 different countries, though; the majority of the studies (37%) were performed in the US. The findings revealed that HAPI could be reduced in a variety of settings and countries and this increases the generalizability of the findings.

A final strength of the articles reviewed suggested a correlation between knowledge scores and HAPI rates. A study conducted by Simonetti, Comparcini, Flacco, Di Giovanni, and Cicolini^[9] found that the knowledge of pressure injury prevention for nurses was relatively low, but also noted an association between higher knowledge scores and an advanced

level of training/education experience. Most study participants showed high attitude scores towards pressure injury prevention. These results suggested that these positive attitudes may contribute to adherence to guidelines in clinical practice.^[9] Bergquist-Beringer et al. (2009) studied the National Database of Nursing Quality Indicators (NDNQI) Pressure Ulcer Training Program to determine its effectiveness in educating nurses about HAPI.^[10] The NDNQI Pressure Ulcer Training Program was created to improve nursing reliability and accuracy for the identification and staging of pressure injuries and the ability to determine the differences in hospital- and unit-acquired injuries from those acquired in the community. A total of 5,200 individuals completed the training program within the first five months of release, and 937 of those participants provided written evaluation comments. The content analysis of the evaluation remarks produced four themes, which included accuracy and clarity of content; pressure injury and other wound pictures; educational/informational experience; and program technology and design. Reviewers focused most of their comments on their positive learning experiences with the program. Components of the program that improved that enhanced the educational experience included a number of pressure injury pictures at each stage and pictures of other wounds to help educate nurses. Findings suggested the NDNQI Pressure Ulcer Training Program effectively educated nursing staffs on pressure injury identification and staging.^[10]

The findings of another study conducted by Samariwo (2010) demonstrated how participants underwent a transition from placing a low to a high value on pressure injury prevention and how this affected patient care.^[11] The pivotal moment in this transition appeared to be when nurses encountered patients with high stage pressure injuries, which caused the nurses to be concerned, more-so than lower stage pressure injuries. This experience caused nurses to re-evaluate their values. Caring for patients with high-grade pressure injuries seemed to increase the value that nurses' behaviors placed on pressure injury prevention. The education that nurses received on pressure injury prevention altered their view of the importance of pressure injury prevention.^[11]

4.3 Nurse competency in the prevention of HAPI

While some studies looked at directly improving nurse knowledge about the prevention of HAPI, others advocated that education just for the sake of certifying that nurses were capable of preventing HAPI was not enough. Development of nursing skills and competence was critical for HAPI prevention in health care facilities.

The literature suggested that to practice safely nurses must have specific knowledge of the actions, benefits, and risks as-

sociated with HAPIs. Nurses need to be able to appropriately document assessment findings, decide when signs and symptoms indicate the likelihood of complications, and implement appropriate actions if these complications arise.^[12]

4.4 Weaknesses

A number of weaknesses were noted during the integrative review. Weaknesses of this review include the fact that most studies were conducted in a number of different hospitals or units, and discussions about the demographics of the hospitals and environment such as nurse staffing, workload, facility policies, and cultures were seldom discussed. Populations were homogenous, limited, or small in most studies, and what worked in one unit with a small study population may not work in a unit with a larger population. Most of the studies were non-experimental and did not use any form of randomization comparing one education program against another.

Another significant issue was the definition of nurse competence, and what skill sets that may include. The variation in standards suggests a need for uniformity at some level. A study in England examined how nurses and health care assistants (HCA's) involved in pressure injury prevention are expected to be competent, but there was limited consensus regarding the definition of competence or the expertise required by people filling different roles. Most training was provided in health care centers by pressure injury prevention nurses or interested non-specialists; England was struggling to catch up to Wales and Scotland in producing learning materials and other resources. Staff members at a strategic health authority were surveyed so a consensus could be reached over a primary curriculum for PI prevention and the competence expected of nurses and HCAs at different levels of seniority. Respondents agreed that five topics should be covered by both nurses and HCAs: pressure ulceration; leg ulceration; diabetic foot; wound healing; and skin care. Levels of competence and expertise depended on seniority. The curricula provided a checklist that local pressure injury prevention nurses could use as a basis for training fellow staff members. Educators should set school curricula for pressure injury prevention and standards of competence.^[13]

The study conducted in Sweden by Gunningberg et al. (2013) described and compared the knowledge of registered nurses, assistant nurses and student nurses about preventing pressure injuries (PIs). Researchers also explored PI prevention behaviors in the clinical practice of assistant nurses and registered nurses. Researchers conducted a descriptive, comparative multicenter study on pressure injury prevention. Hospital wards and universities from four Swedish county councils participated. A total of 415 participants completed

the Pressure Ulcer Knowledge Assessment Tool, and the mean knowledge score for the sample was 58.9%. Their research on nursing staffs in Sweden showed that there was a knowledge shortfall for PI. Study recommendations indicated that a significant educational campaign for PI prevention was needed in both nursing education and in hospital settings.^[8]

Another weakness that was noted was the fact that even though most healthcare facilities had HAPI prevention guidelines, failure to follow those guidelines were frequently reported.^[9] Surprisingly, a study conducted by Khong, Hoi, Holroyd, and Wang (2015) found nurses said that preventing pressure injury was not one of their top priorities as it increased nurses' daily workload.^[14] Even when the need for HAPI prevention guidelines was noted, there was often a failure to follow guidelines and make HAPI prevention a priority.

Finally, a lack of education in this aspect of clinical care was often cited as one of the reasons for the continuing high prevalence and incidence of pressure injuries. However, one literature reviews suggest that this is not always the case, indicating that there are other considerations worth noting.^[15] Some nurses felt that it would be "better" for the patient if they sought their leaders' opinions before dressing wounds.^[14] Technology-based programs such as Web-based training were increasingly documented in nurse education, but they were not the perfect solution. Technology-assisted Braden Scale training improved both reliability and precision of risk assessments made by new users of the scale, but had virtually no effect on the reliability or accuracy of risk assessments made by regular users of the instrument.^[16] They stated that more research was required to determine best courses of action for increasing precision and reliability of Braden Scale assessments performed by its regular users.^[16] They also stated that Web-based training alone may not ensure competent, reliable estimates of pressure injury risk for patients at all risk levels. Additional strategies, such as clinical practice under the supervision of experts should also be considered. More research was also recommended to clarify the connections between scoring Braden subscales correctly and selecting appropriate risk-based preventive interventions.^[17]

4.5 Limitations

This review was limited in several ways. References may have been overlooked if they were not searchable in the included databases. Additionally, as a result of language restrictions, selection bias may have occurred. There was no literature from low-resource countries, yet it is likely that wound care is an important role for nurses in those countries. There was some variation between US standards and other

nations' standards in defining HAPIs, which could impact comparisons of the various studies.

4.6 Gaps

Appraisal of the literature suggested that various HAPI education programs have improved nurses' knowledge and competency, and decreased HAPI occurrences. Several gaps manifested themselves during the integrative review. The findings reiterate the need for more rigorous research in the area of HAPI prevention efforts and connecting those efforts into an internationally recognized CBE HAPI prevention standard for nurses. This would help ensure a common standard of prevention processes for the prevention of HAPI.

The studies reviewed also showed that nurses' judgments and decision-making ability related to pressure injuries have centered on comparisons of different pressure injuries, pressure injury risk assessments, and nurses' clinical judgments to precisely determine a patient's risk of forming a pressure injury. Future research must examine how nurses obtain, analyze, and operationalize data related to skin integrity and pressure injuries in order to gain increased understanding of how nurses make judgments and decisions about the delivery of care for pressure injury prevention in clinical practice. Once there is a greater understanding of this information, that data should then be utilized to develop a CBE program for HAPI prevention.

4.7 Translation of the evidence into practice

HAPIs have become a global health burden. The evaluation and integration of evidence-based practices for preventing

HAPIs and translating research into practice (TRIP) is a vital key to reducing incidence rates in health care organizations. Organizations survive because they understand the importance of TRIP for quality improvement (QI). According to White and Dudley-Brown (2011), "the ability to translate evidence into routine clinical practices in health care is fundamental in ensuring the quality of health care delivery".^[18]

5. CONCLUSION

Appraisal of the literature suggested the various HAPI education programs have increased nurses' knowledge in HAPI identification and prevention. Challenges continue to remain for health care organizations and health providers to determine the applicability of these programs to their nursing staff and translate the best evidence into practice. Improving nurses' knowledge of HAPI prevention should, in turn, result in preventing HAPI incidents. Given the lack of quality studies in the area of nurse education about HAPI prevention, we suggest research in this area. We recommend identifying and reinforcing standardized professional competency-based education and creating a culture of success to assure high-quality care and safety outcomes for patients.

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CONFLICTS OF INTEREST DISCLOSURE

There are no conflicts of interest associated with this review.

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