

ORIGINAL RESEARCH

A systematic review investigating the effectiveness of interventions in preventing stage 1 and 2 pressure injury of hospitalized elderly patients

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ABSTRACT

Pressure injuries are now the third most costly disease after cancer and cardiovascular disease. Around 60,000 deaths occur annually from the complications of pressure injuries. Pressure injuries are preventable but frequently result in adverse events or severe complications such as infection when developed. This study aims to determine which interventions prevent hospitalized-acquired pressure injuries and are more effective in hospitalized elderly patients. The design used in this study is a systematic review. As presented, it summarizes the studies that were analyzed in the effective interventions in the prevention of pressure injuries in hospitalized elderly patients. Multiple interventions include healthcare professionals' teamwork measures, education of the healthcare staff, use of risk-assessment tools, offloaded heels or bony prominences, repositioning, and assessment of the nutritional status and the skin. Increasing staff knowledge and patient and family involvement improved health outcomes. There was a significant reduction in the incidence of hospitalized-acquired pressure injuries in elderly patients.

Key Words: Pressure injury, Prevention, Effectiveness, Elderly

1. INTRODUCTION

Pressure injuries (also known previously as pressure ulcers, pressure sores, and bedsores) are skin injuries or damage of an underlying tissue over bony prominence. Friction or shear may result in a pressure injury.^[1] Pressure injuries are now the third most costly disease after cancer and cardiovascular diseases.^[2] The global collective prevalence of 1,366,848 patients was 12.8%. The collective incidence rate of 681,885 patients was 5.4 per 10,000 patients - days and the collective hospitalized-acquired pressure injuries rate of 1,893,593 was 8.4%. Stage I accounts for 43.5% while 28% accounts for Stage II pressure injuries. These two are the most commonly occurring stages of pressure injuries.^[3] Erythema or skin redness is classified as stage I pressure injury. This pressure

injury does not display any skin breaks or tears. Erythema with partial skin thickness loss, including the epidermis and a portion of the superficial dermis, is considered a stage II pressure injury.^[4] Mortality rates increased from 2 to 6 times as much as the other diseases causing around 60,000 deaths annually.^[2] One of the major complications of pressure injuries is associated with infection which often leads to chronic non-healing wounds and osteomyelitis.^[4] Hospitals and long-term care facilities have substantial problems related to skin and soft tissue injuries. These can result in a decrease in the quality of a patient's life, added cost to the patient and institution, increased length of stay, and heightened morbidity and mortality.^[5]

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Around 95% of the developed pressure injuries are preventable.^[6] Risk factors in forming pressure injuries may include elderliness or advanced age, immobility, sensory and perfusion impairment, incontinence, malnutrition, dehydration, neurosensory deficit, device-related skin pressure, circulatory problems, and multiple comorbidities.^[6] Other patients with comorbidities are at a higher risk for pressure injury development such as those with cardiovascular or cerebrovascular disease, lower extremity fracture, diabetes mellitus, and incontinence.^[6]

Aging can pose older patients with a higher risk for developing pressure injuries due to the thinning of the skin – the dermis and epidermis, leading to decreased resistance to shear and friction forces.^[5] Some of the interventions include the use of support surfaces, multiple intervention programs, education of health care professionals, use of risk-assessment tools, repositioning, and early mobilization, reminder systems in the patient care plan, preventive skin care, and prophylactic dressing.^[1]

Healthcare professional education on preventive care can be effective in reducing the incidence of hospitalized-acquired pressure injuries.^[1] Evidence-based guidelines for the prevention of pressure injuries have been established broadly and have been supported globally. However, the lack of knowledge and skills of healthcare professionals in the prevention of hospitalized pressure injuries contributes significantly to the occurrence of pressure injuries.^[7]

The prevention of pressure injuries remains common and with high incidence in hospitals and the community despite the efforts being made. According to research, the key goal of pressure injury is prevention.^[8] This study aims to determine which interventions prevent hospitalized-acquired pressure injuries and which are more effective in hospitalized elderly patients through a systematic review of the literature.

2. METHOD

This is a systematic review and was performed following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. This study qualified for an exemption under the category of the Institutional Review Board that the information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subject.^[9]

2.1 Inclusion and exclusion criteria

Peer-reviewed studies were included if they were: (a) a primary source article that was published from 2016-2022, (b) an article with significant keywords, (c) a study in humans as

subjects, (d) interventions and their effectiveness in the prevention of pressure injury stage 1 or stage 2, (e) a study with a systematic review, prospective RCT, RCT, prospective quasi-experimental study, prospective study, quasi-experimental study, (f) elderly over 60 years admitted in hospital wards, acute or chronic settings: ICU, Medical-Surgical, Surgical, Geriatrics, and Nursing home care (see Table 1), (g) preventive interventions that are done in hospital adult units: repositioning, prophylactic dressing/foam dressing, health-care professional education, multiple interventions, support surfaces, risk assessment tools, reminder system in patient care, and (h) published in English.

Table 1. Adult unit

ICU	19
Medical-Surgical	5
Surgical	4
Geriatrics	2
Nursing home care	3

Letters, editorials, commentaries, and conference presentations were excluded. Exclusion criteria include (a) records that were excluded at the title and abstract level were not related to the prevention of pressure injury, (b) reports that have duplicates, (c) articles that were not in full text, (d) articles with full text but did not mention the effectiveness of pressure injury interventions, (e) articles with other outcomes not related to the prevention of pressure injuries, (f) articles conducted in other settings outside the hospitals, (g) articles published in other languages aside from English, and (h) articles that did not utilize a systematic review.

2.2 Search strategy

The studies were broadly acknowledged by searching the following databases via electronic gathering: PubMed, Google Scholar, EBSCOhost, ProQuest, and Cochrane Trusted Evidence. Keywords that were used for this study were “pressure injury”, “prevention”, “effectiveness”, and “elderly”. Medical subject headings were used to conduct searches depending on the database, free test words, and keywords. Using the Boolean operator “OR” synonyms and alternate spellings were mixed. Boolean “AND” was used to combine the primary terms. The included articles in the reference list were investigated to search for more possible articles.

2.3 Data extraction and quality assessment

The data extraction was developed based on the PRISMA guidelines. The quality assessment was assessed using the evidence-based librarianship (EBL) Critical Appraisal checklist. This tool assessed included studies’ validity, relevance, and applicability based on population, study design, data

collection, and results. The Joanna Briggs Institute Meta-Analysis of Statistics Assessments and Review Instrument (JBI-MASARI) was utilized to assess published papers' relevance and dependability of systematic articles.

2.4 Study risk of bias assessment

The Joanna Briggs Institute (JBI) was utilized to minimize bias. The risk of bias assessment is completed to establish transparency and eliminate bias in the findings. The critical appraisal methods offered by JBI helped evaluate the reliability, applicability, and outcomes of published systematic review articles.

3. RESULTS

This study aimed to determine which interventions prevent hospitalized-acquired pressure injuries and are more effective in hospitalized elderly patients. This study reviewed and briefly summarized studies that assessed the effective interventions in preventing the occurrence of hospitalized-

acquired pressure injuries in the elderly that were published from 2016 to 2022.

Out of 144 articles in the preliminary screening, only 127 passed the secondary screening. Most articles were removed due to the following reasons: (1) the titles and abstract levels were not related to the prevention of pressure injury (n = 54), (2) reports were duplicated (n = 26), (3) articles were not in full text (n = 25), (4) articles with full-text but did not mention the effectiveness of pressure injury interventions (n = 59), (5) other outcomes not related to the prevention of pressure injury (n = 4), (6) other settings outside the hospital (n = 25), (7) other languages aside from English (n = 5), and (8) did not utilize a systematic review (n = 25). After screening and applying the inclusion and exclusion criteria, 12 out of 144 papers were determined to be eligible to be included in this study (see Figure 1). The primary outcome of pressure injury prevention and its effectiveness were reported in these investigations.

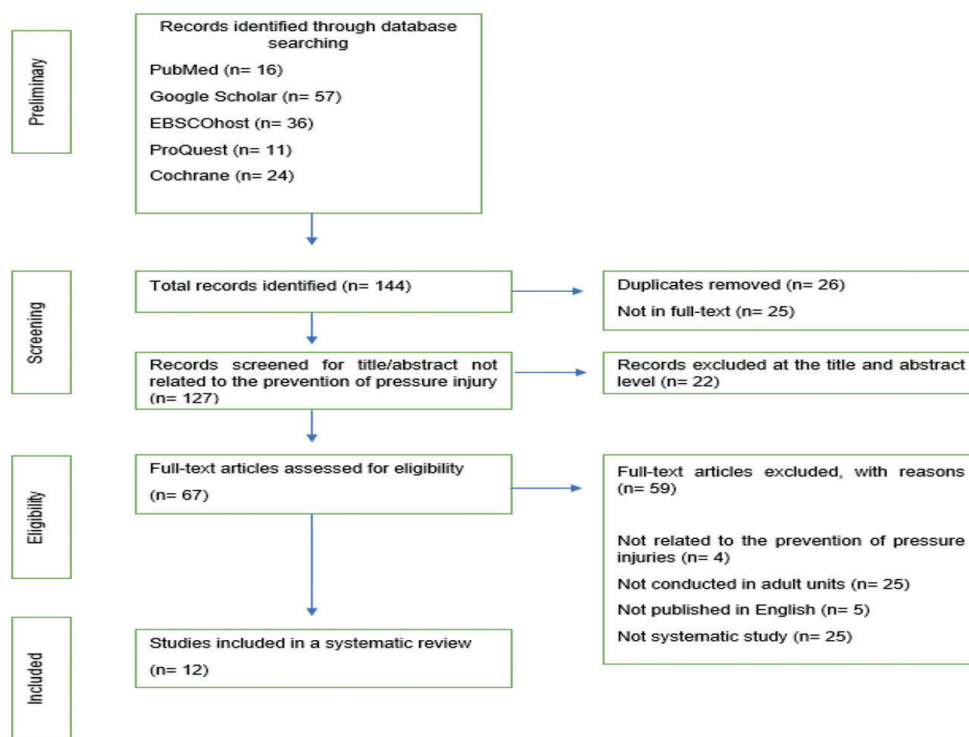


Figure 1. Search strategy and study selection PRISMA flow diagram

Articles that utilized RCT as their study design revealed the greatest number found followed by systematic review articles (see Table 2). The preventive intervention risk-assessment tools had the highest effectiveness in articles, followed by repositioning, healthcare professional education, multiple interventions, and support surfaces (see Table 3).

Table 2. Study design

Prospective RCT	2
RCT	18
Prospective quasi-experimental study	1
Prospective study	1
Quasi-experimental study	5
Systematic Review	12

Table 3. Preventive intervention

Repositioning	6
Prophylactic dressing/foam dressing	5
Healthcare Professional Education	6
Multiple interventions	6
Support surfaces	6
Risk assessment tools	7
Reminder system in patient care	2

In this study, these are the most effective interventions in preventing pressure injuries in hospitalized elderly patients. Multiple interventions include healthcare professionals' practice in preventive measures, educating healthcare staff, and increasing staff knowledge.^[10] Reminder systems can be used in combination with other interventions such as repositioning with a frequency of 2-3 hours.^[11] A significant decrease in the development of pressure injuries is evident with the application of prophylactic dressings/foam dressings.^[12] Support surfaces that provide alternating pressure (active) benefit bedbound elderly patients in effectively preventing pressure injury.^[13] Healthcare professional education and the utilization of risk assessment tools, such as the Braden scale, were effective in decreasing the occurrence of the development of pressure injuries.^[14] These interventions engage the staff in patient care and aid in the reduction of the incidence of pressure injuries. Early identification showed decreased incidence, less severe pressure injury, reduced hospital costs, and shortened hospital stay.

Multiple intervention programs were effective in reducing the incidence of pressure injuries. There is no direct correlation between the repositioning regimen in the incidence of pressure injury. A meta-analysis study revealed that a silicone foam dressing method significantly reduces the frequency of hospitalized-acquired pressure injuries in critically ill patients. Silicone dressings may have decreased pressure injury incidence at any stage.^[15] The meta-analysis for the Braden scale displayed moderate predictive validity, but its interpretation is limited. The Braden Scale was an effective risk assessment in the ICU setting. Early risk identification and preventive strategies in the prevention of hospitalized-acquired pressure injury programs showed decreased, less, severe injury and decreased hospital costs. The Waterflow scale has low sensitivity compared to other screening scale tools.^[16] Active air surfaces of alternating pressure may have decreased the development of a new pressure injury compared to foam surfaces.^[17] Evidenced-based care bundles include risk assessment on admission to the ICU, unit-based skincare expertise, staff education, frequent risk reassessments, daily skin inspections, moisture removal treatments,

nutritional and hydration, offloading, and protective surface protocols.

4. DISCUSSION

The multiple interventions, repositioning, offloading heels or bony prominences, prophylactic dressing/foam dressing, support surface, staff education, reminder system in the patient care plan, and use of risk assessment tools, healthcare professionals' teamwork measures, assessing nutritional status, and skin assessment were more effective in reducing hospitalized-acquired pressure injuries in elderly patients. Studies of different interventions revealed that care bundles were more effective than a single intervention in preventing the development of hospitalized-acquired pressure injuries in elderly patients, which healthcare providers can apply. Teamwork plays a vital role in successfully preventing pressure injuries and involving the patient and family in practicing the care bundle interventions results in improved health outcomes.

Reminder systems in patient care plans using sensor-based methods helped healthcare professionals identify pressure points for a certain time when a patient is in a lying position. This method assisted in predicting the risk of pressure injury development.^[18] The most recommended intervention and best-practice guideline to release pressure on bony prominences and to provide comfort to bedbound elderly patients is repositioning. The standard frequency of repositioning was every 2 hours in preventing pressure injury development. The occurrence of pressure injury development is lesser in those patients who were repositioned every 2-3 hours compared to those who were repositioned every 4-6 hours, however, the evidence of this study was low.^[19]

The application of prophylactic dressings/foam dressings had overall relevance in the reduction of pressure injuries in high-risk patients. These prophylactic dressings were also effective in managing the moisture in the skin. The use of different prophylactic dressings may differ in the bony prominence to be more effective such as multilayered foam dressing on heels and sacrum. Polyurethane films had well outcomes in the effective prevention of pressure injury development compared to hydrocolloids. The pressure force on the bony prominences is one of the main triggers that places the patient at risk of tissue damage. Support surfaces such as alternating pressure air surfaces reduced pressure injury in high-risk patients compared to foam surfaces and reactive gel surfaces applied on the hospital bed. The alternating-pressure air mattress was best used in an ICU setting for the prevention of pressure injury in high-risk bedbound patients. Healthcare professional education was effective in decreasing

the occurrence of pressure injuries. Encouraging healthcare professionals to work on a shared goal in reducing the occurrence of pressure injury development by providing guidelines and protocols towards preventive measure practices.

The risk-assessment tools can be used in screening high-risk patients. Using these recommended risk-assessment tool guidelines (Braden, Waterflow, and Norton Scale) helped in the early identification of high-risk patients in preventing the development of pressure injuries. This intervention was used with daily skin inspection and to apply specific interventions in preventing high-risk patients from developing a pressure injury. Out of the three scales that were mentioned, the Braden scale was the most effective risk assessment tool. The Braden scale allowed the early identification of high-risk patients and the application of strategies preventing hospitalized-acquired pressure injury which resulted in less severe pressure injuries and decreased hospital costs.

Risk-assessment tools figured predominantly in all studies reviewed. Six articles revealed that risk-assessment tools are more effective than other preventive interventions mentioned above.

Limitations

The primary limitations of included studies are found to be heterogeneity, sample size, follow-up, treatment, includes studies, design, definitions, synthesis, quality, and search. These limitations were ascribed to the original research in these systematic reviews of the systematic reviews that were included.

5. CONCLUSION

Pressure injury is preventable but can be a significant cause of mortality and morbidity worldwide. With the existing interventions to prevent pressure injuries with the utilization of care bundles, programs should be developed according to the international clinical practice guidelines. Policymakers and managers need to develop strategies focusing on facilitating standardized admission assessment using effective standardized tools and implementing standardized education programs for healthcare staffs. These strategies will promote guideline implementation of care bundles to prevent pressure injury in high-risk elderly patients.

Recommendations

The investigation in this study revealed that effective interventions in preventing pressure injuries are limited due to the lack of systematic review articles. Future research should

examine the effectiveness of care bundle interventions in preventing pressure injury in hospitalized elderly patients compared to single-component interventions and their implementation strategies. The care bundle interventions can be applied in the improvement of policies, protocols, or guidelines in the hospitals. Further review using meta-analysis adds to the findings reported here.

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The author declares that there is no conflict of interest.

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DATA SHARING STATEMENT

No additional data are available.

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REFERENCES

- [1] Gaspar S, Peralta M, Marques A, et al. Effectiveness on hospital-acquired pressure ulcers prevention: a systematic review. *International Wound Journal*. 2019; 16(5): 1087-1102. <https://doi.org/10.1111/iwj.13147>
- [2] Borojeny LA, Albatineh AN, Dehkordi AH, et al. The incidence of pressure ulcers and its associations in different wards of the hospital: a systematic review and meta-analysis. *International Journal of Preventive Medicine*. 2020; 11. https://doi.org/10.4103/ijpvm.IJPVM_182_19
- [3] Li Z, Lin F, Thalib L, et al. Global prevalence and incidence of pressure injuries in hospitalised adult patients: A systematic review and meta-analysis. *International Journal of Nursing Studies*. 2020; 105: 103546. <https://doi.org/10.1016/j.ijnurstu.2020.103546>
- [4] Al Aboud AM, Manna B. Wound pressure injury management. 2018.
- [5] Mondragon N, Zito PM. Pressure injury. *StatPearls-NCBI Bookshelf*. 2021.
- [6] Ebi WE, Hirko GF, Mijena DA. Nurses' knowledge to pressure ulcer prevention in public hospitals in Wollega: a cross-sectional study design. *BMC Nursing*. 2019; 18(1): 1-12. <https://doi.org/10.1186/s12912-019-0346-y>
- [7] Kaddourah B, Abu-Shaheen AK, Al-Tannir M. Knowledge and attitudes of health professionals Towards pressure ulcers at a rehabilitation hospital: a cross-sectional study. *BMC Nursing*. 2016; 15(1). <https://doi.org/10.1186/s12912-016-0138-6>
- [8] Mervis JS, Phillips TJ. Pressure ulcers: Prevention and management. *Journal of the American Academy of Dermatology*. 2019; 81(4): 893-902. <https://doi.org/10.1016/j.jaad.2018.12.068>
- [9] Protections OFHR. Exemption (2018 requirements). 2024.
- [10] Tayyib N, Coyer F. Effectiveness of pressure ulcer prevention strategies for adult patients in intensive care units: a systematic review. *Worldviews on Evidence-based Nursing*. 2016; 13(6): 432-444. <https://doi.org/10.1111/wvn.12177>
- [11] Avsar P, Moore Z, Patton D, et al. Repositioning for preventing pressure ulcers: a systematic review and meta-analysis. *Journal of Wound Care*. 2020; 29(9): 496-508. <https://doi.org/10.12968/jowc.2020.29.9.496>
- [12] Fulbrook P, Mbuvi V, Miles S. Effectiveness of prophylactic sacral protective dressings to prevent pressure injury: a systematic review and meta-analysis. *International Journal of Nursing Studies*. 2019; 100: 103400.
- [13] Serraes B, Van Leen M, Schols J, et al. Prevention of pressure ulcers with a static air support surface: A systematic review. *International Wound Journal*. 2018; 15(3): 333-343. <https://doi.org/10.1111/iwj.12870>
- [14] Floyd NA, Dominguez-Cancino KA, Butler LG, et al. The effectiveness of care bundles including the Braden scale for preventing hospital-acquired pressure ulcers in older adults hospitalized in ICUs: A Systematic review. *The Open Nursing Journal*. 2021; 15(1).
- [15] Moore ZE, Webster J. Dressings and topical agents for preventing pressure ulcers. *Cochrane Database Of Systematic Reviews*. 2018; (12). <https://doi.org/10.1002/14651858.CD009362.pub3>
- [16] Seong-Hi PARK, Lee HS. Assessing predictive validity of pressure ulcer risk scales-a systematic review and meta-analysis. *Iranian Journal of Public Health*. 2016; 45(2): 122.
- [17] Shi C, Dumville JC, Cullum N, et al. Alternating pressure (active) air surfaces for preventing pressure ulcers. *Cochrane Database of Systematic Reviews*. 2021. <https://doi.org/10.1002/14651858.CD013620.pub2>
- [18] Silva A, Metrôlho J, Ribeiro F, et al. A Review of Intelligent Sensor-Based Systems for Pressure Ulcer Prevention. *Computers*. 2021; 11(1): 6. <https://doi.org/10.3390/computers11010006>
- [19] Gillespie BM, Walker RM, Latimer SL, et al. Repositioning for pressure injury prevention in adults. *Cochrane Database of Systematic Reviews*. 2020. <https://doi.org/10.1002/14651858.CD009588.pub3>