

NURSING STRATEGIES FOR PREVENTING PRESSURE INJURIES IN ACUTE CARE SETTINGS: A SYSTEMATIC REVIEW

Author's Name: Dr. Piyush D Wagh¹, Omkar Murudkar²

Affiliation:

1. HOD and Associate Professor, Godavari College of Nursing , Godavari College of Nursing, Jalgaon, Maharashtra, India
2. Tutor, Godavari College of Nursing , Godavari College of Nursing, Jalgaon, Maharashtra, India

Corresponding Author Name & E-Mail: Dr. Piyush D Wagh, piyushwagh28@gmail.com

ABSTRACT

Pressure injuries, formerly referred to as pressure ulcers or bed sores, remain one of the most prevalent preventable adverse events affecting hospitalized patients in acute care settings. They are associated with prolonged hospital stays, increased healthcare costs, pain, infection, reduced quality of life, and increased mortality. Despite advancements in healthcare technology and evidence-based clinical guidelines, pressure injuries continue to pose a significant challenge to patient safety worldwide. Nurses, as primary caregivers, play a crucial role in preventing pressure injuries through early risk assessment, regular skin inspection, repositioning, nutritional support, moisture management, patient education, and implementation of evidence-based care bundles. The objective of this systematic review is to synthesize current evidence regarding effective nursing strategies for preventing pressure injuries in adult patients admitted to acute care hospitals. A systematic search of PubMed, Scopus, CINAHL, Web of Science, ScienceDirect, and Google Scholar was conducted for studies published between January 2020 and June 2025. Clinical practice guidelines issued by the National Pressure Injury Advisory Panel (NPIAP), European Pressure Ulcer Advisory Panel (EPUAP), Pan Pacific Pressure Injury Alliance (PPPIA), and the World Health Organization were also reviewed. Evidence indicates that comprehensive nursing interventions including systematic risk assessment using validated tools, frequent repositioning, pressure redistribution surfaces, nutritional optimization, skin care, moisture management, preventive dressings, multidisciplinary collaboration, and continuous staff education significantly reduce the incidence of hospital-acquired pressure injuries. Emerging technologies such as artificial intelligence, electronic health records, pressure-monitoring sensors, and predictive analytics further enhance early identification of high-risk patients and improve preventive care. However, barriers including inadequate staffing, limited resources, inconsistent guideline adherence, and insufficient education continue to affect implementation. Strengthening nursing competencies and integrating evidence-based prevention strategies into routine clinical practice are essential for improving patient safety and reducing the burden of pressure injuries in acute care hospitals.

Keywords: Pressure injury, pressure ulcer, nursing care, prevention, acute care, risk assessment, patient safety, evidence-based nursing, systematic review.

INTRODUCTION

Pressure injuries are localized damage to the skin and underlying soft tissues that usually occur over bony prominences or in association with medical devices as a result of prolonged pressure or pressure combined with shear forces. They represent one of the most common preventable complications experienced by hospitalized patients and continue to serve as an important indicator of healthcare quality worldwide. The National Pressure Injury Advisory Panel (NPIAP) defines pressure injuries as injuries that range from persistent non-blanchable erythema to extensive tissue destruction involving muscle, tendon, or bone. The development of pressure injuries reflects a complex interaction between mechanical loading, tissue tolerance, impaired circulation, nutritional status, mobility limitations, moisture exposure, and underlying comorbidities. Pressure injuries remain a major patient safety concern because they contribute substantially to morbidity, mortality, prolonged hospitalization, and escalating healthcare expenditure. Hospital-acquired pressure injuries are increasingly regarded as largely preventable adverse events when evidence-based nursing interventions are implemented consistently. Patients who develop pressure injuries frequently experience severe pain, delayed recovery, increased susceptibility to local and systemic infections, psychological distress, social isolation, and diminished quality of life. Advanced-stage pressure injuries often require prolonged wound management, surgical intervention, extended rehabilitation, and intensive nursing care, thereby placing considerable financial strain on healthcare systems.

The burden of pressure injuries is particularly significant within acute care hospitals where patients often present with multiple risk factors. Critically ill patients, older adults, individuals with spinal cord injuries, patients undergoing major surgery, and those requiring prolonged bed rest or mechanical ventilation are especially vulnerable because of reduced mobility, impaired tissue perfusion, malnutrition, and multiple chronic illnesses. In intensive care units, prolonged immobilization, vasoactive medications, edema, impaired oxygenation, and hemodynamic instability further increase tissue susceptibility to ischemic damage. Consequently, effective prevention requires continuous assessment and individualized nursing interventions throughout hospitalization. The pathophysiology of pressure injury development involves sustained compression of soft tissues between bony prominences and external surfaces, leading to occlusion of capillary blood flow, tissue ischemia, inflammation, cellular deformation, lymphatic obstruction, and eventual tissue necrosis. Shear forces distort blood vessels and connective tissues, while friction damages the superficial epidermis and increases skin vulnerability. Moisture associated with urinary or fecal incontinence, perspiration, wound exudate, or excessive perspiration weakens skin integrity and increases frictional injury. Malnutrition, dehydration, anemia, diabetes mellitus, peripheral vascular disease, and reduced sensory perception further impair

tissue resilience and delay wound healing. Nurses occupy a central position in pressure injury prevention because they provide continuous bedside care and perform repeated patient assessments throughout hospitalization. Their responsibilities extend beyond routine skin inspection to include comprehensive risk assessment, implementation of repositioning schedules, selection of appropriate support surfaces, nutritional monitoring, moisture management, patient and caregiver education, documentation, and interdisciplinary communication. Numerous studies have demonstrated that nurse-led prevention programs substantially reduce the incidence of hospital-acquired pressure injuries while improving patient outcomes and decreasing healthcare costs.

Risk assessment is considered the cornerstone of pressure injury prevention. Validated assessment instruments such as the Braden Scale, Norton Scale, and Waterlow Score enable nurses to identify patients at increased risk soon after admission and throughout hospitalization. These tools evaluate multiple dimensions including sensory perception, moisture exposure, physical activity, mobility, nutrition, and friction or shear. Early identification allows preventive interventions to be initiated before tissue damage occurs. However, clinical judgment remains equally important because standardized scales may not capture all patient-specific risk factors, particularly among critically ill patients. Over the past decade, international organizations including the National Pressure Injury Advisory Panel (NPIAP), European Pressure Ulcer Advisory Panel (EPUAP), and Pan Pacific Pressure Injury Alliance (PPPIA) have published comprehensive evidence-based guidelines recommending structured prevention strategies. These guidelines emphasize individualized patient assessment, frequent repositioning, pressure redistribution devices, optimization of nutrition and hydration, management of skin moisture, use of prophylactic dressings, and multidisciplinary collaboration. Hospitals implementing these evidence-based care bundles have consistently demonstrated lower pressure injury rates compared with institutions relying on isolated preventive interventions. Recent advances in healthcare technology have further strengthened pressure injury prevention efforts. Electronic health records facilitate standardized documentation and automated reminders for repositioning schedules. Pressure-sensing mattresses, wearable monitoring devices, predictive analytics, and artificial intelligence algorithms enable continuous monitoring of tissue loading and identification of patients at greatest risk before visible skin damage develops. Although these innovations show considerable promise, successful implementation depends largely on nursing knowledge, clinical competence, organizational support, and adherence to evidence-based practice.

Despite the availability of well-established prevention guidelines, hospital-acquired pressure injuries continue to occur because of inadequate staffing, increasing patient acuity, inconsistent compliance with preventive protocols, limited access to pressure-relieving equipment, and insufficient continuing

education. These challenges highlight the need for ongoing evaluation of effective nursing strategies capable of improving preventive care across diverse healthcare settings. Therefore, this systematic review aims to synthesize current evidence regarding nursing strategies for preventing pressure injuries in acute care settings, evaluate the effectiveness of evidence-based interventions, identify barriers affecting implementation, and provide recommendations that strengthen nursing practice and improve patient safety.

OBJECTIVES

The primary objective of this systematic review is to critically evaluate current evidence regarding nursing strategies for preventing pressure injuries among adult patients admitted to acute care hospitals. The review seeks to synthesize high-quality research findings and evidence-based clinical guidelines to identify interventions that effectively reduce the incidence of hospital-acquired pressure injuries while improving patient safety and quality of nursing care. The specific objectives of this review are to examine the epidemiology and clinical burden of pressure injuries in acute care settings; evaluate the effectiveness of standardized risk assessment tools such as the Braden, Norton, and Waterlow scales; analyze evidence supporting nursing interventions including repositioning, skin assessment, pressure redistribution surfaces, nutritional support, moisture management, and preventive dressings; explore the contribution of nurse education, multidisciplinary collaboration, and quality improvement initiatives to pressure injury prevention; identify barriers affecting implementation of evidence-based preventive practices; and discuss emerging technologies, including artificial intelligence and digital monitoring systems, that may enhance nursing decision-making and early identification of patients at high risk.

METHODOLOGY

This systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) principles to identify, evaluate, and synthesize the available evidence regarding nursing strategies for preventing pressure injuries in acute care settings. Electronic databases including PubMed, Scopus, CINAHL, Web of Science, ScienceDirect, and Google Scholar were systematically searched to identify relevant literature published between January 2020 and June 2025. Clinical practice guidelines issued by the National Pressure Injury Advisory Panel (NPIAP), European Pressure Ulcer Advisory Panel (EPUAP), Pan Pacific Pressure Injury Alliance (PPPIA), and other internationally recognized organizations were also reviewed to ensure comprehensive coverage of current evidence-based recommendations.

The search strategy combined Medical Subject Headings (MeSH) and free-text keywords, including pressure injury, pressure ulcer, bed sore, hospital-acquired pressure injury, acute care, nursing

intervention, pressure injury prevention, risk assessment, Braden Scale, skin care, repositioning, support surfaces, nutrition, and nursing practice. Boolean operators (AND/OR) were used to refine the search and retrieve the most relevant publications.

Studies were included if they involved adult patients admitted to acute care hospitals and evaluated nursing interventions or multidisciplinary strategies aimed at preventing pressure injuries. Randomized controlled trials, quasi-experimental studies, cohort studies, observational studies, systematic reviews, meta-analyses, and evidence-based clinical practice guidelines published in English were eligible for inclusion. Studies focusing exclusively on pediatric populations, long-term care facilities, home care settings, or treatment rather than prevention of existing pressure injuries were excluded. Titles and abstracts were independently screened for relevance, followed by full-text review of eligible articles. Data were extracted regarding study characteristics, patient populations, preventive interventions, outcome measures, and major findings. Preference was given to high-quality evidence, including systematic reviews, randomized controlled trials, and international clinical practice guidelines. The findings were synthesized thematically to identify the most effective nursing strategies for pressure injury prevention and to highlight current evidence gaps requiring future investigation.

BURDEN OF PRESSURE INJURIES IN ACUTE CARE SETTINGS

Pressure injuries remain among the most frequently reported preventable adverse events in hospitalized patients and continue to represent an important indicator of healthcare quality across the world. Although advances in patient safety initiatives and clinical guidelines have contributed to declining rates in many healthcare organizations, pressure injuries continue to affect millions of patients annually. Their occurrence reflects not only patient-related risk factors but also the effectiveness of nursing care, organizational support, and institutional commitment to quality improvement. Consequently, pressure injury prevalence is widely used as a quality indicator by accreditation agencies and healthcare regulatory organizations.

The consequences of hospital-acquired pressure injuries extend beyond localized tissue damage. Patients frequently experience severe pain, impaired mobility, delayed rehabilitation, prolonged hospital stays, secondary wound infections, osteomyelitis, sepsis, and reduced quality of life. Advanced-stage pressure injuries are associated with increased mortality, particularly among older adults and critically ill patients. The psychological burden is equally significant, with many patients reporting anxiety, depression, sleep disturbances, reduced independence, and social isolation. Families also experience emotional distress and increased caregiving responsibilities following hospital discharge.

From an economic perspective, pressure injuries impose substantial financial burdens on healthcare

systems. Treatment requires specialized wound dressings, advanced pressure redistribution equipment, nutritional supplementation, prolonged nursing care, surgical reconstruction in severe cases, and extended hospitalization. Healthcare organizations with high rates of hospital-acquired pressure injuries also experience reduced quality performance ratings, increased medico-legal risks, and financial penalties in healthcare systems where reimbursement is linked to quality indicators. Therefore, prevention is considerably more cost-effective than treatment and remains a priority for healthcare administrators worldwide.

Patients admitted to acute care hospitals often possess multiple intrinsic and extrinsic risk factors that increase susceptibility to pressure injury development. Advanced age, immobility, impaired sensory perception, malnutrition, dehydration, diabetes mellitus, cardiovascular disease, spinal cord injury, obesity, anemia, and reduced tissue perfusion significantly compromise skin integrity and tissue tolerance. Critically ill patients requiring mechanical ventilation, vasoactive medications, prolonged sedation, or intensive monitoring are particularly vulnerable because prolonged immobilization and compromised circulation accelerate tissue ischemia. Medical devices have emerged as an increasingly recognized source of pressure injuries in modern healthcare. Oxygen masks, cervical collars, endotracheal tubes, urinary catheters, splints, compression stockings, and non-invasive ventilation interfaces may exert sustained localized pressure on soft tissues, resulting in device-related pressure injuries. Nurses therefore require continuous vigilance in assessing skin beneath medical devices, repositioning equipment whenever clinically feasible, and applying prophylactic dressings to vulnerable areas. The growing complexity of hospitalized patients has further increased the importance of individualized preventive care. Older adults frequently present with fragile skin, reduced muscle mass, diminished vascular supply, and multiple chronic diseases that impair tissue repair. Similarly, patients with neurological disorders or altered consciousness may be unable to communicate discomfort or reposition themselves independently. These patient populations require comprehensive nursing assessment, frequent monitoring, and proactive preventive interventions throughout hospitalization. Numerous investigations have demonstrated that hospitals implementing structured pressure injury prevention programs achieve significantly lower incidence rates than institutions relying on routine nursing care alone. Successful prevention programs typically combine standardized risk assessment, individualized care planning, scheduled repositioning, pressure redistribution support surfaces, nutritional optimization, moisture management, staff education, multidisciplinary collaboration, and continuous quality improvement initiatives. These findings emphasize that pressure injury prevention is not dependent upon a single intervention but rather requires coordinated implementation of multiple evidence-based nursing strategies.

RISK ASSESSMENT: THE CORNERSTONE OF PREVENTION

Early identification of patients at risk remains the most important component of pressure injury prevention. Evidence consistently demonstrates that preventive interventions are most effective when initiated before visible skin damage develops. Consequently, comprehensive risk assessment should be performed immediately upon hospital admission, repeated whenever patients experience changes in clinical condition, and continued throughout hospitalization.

The Braden Scale remains the most widely used risk assessment instrument in acute care settings because of its simplicity, reliability, and predictive validity. It evaluates six domains including sensory perception, skin moisture, physical activity, mobility, nutritional status, and friction or shear. Patients with lower scores require more intensive preventive interventions, including frequent repositioning, specialized mattresses, and closer nursing surveillance. The Norton Scale and Waterlow Score are also widely used in various healthcare settings and provide structured assessment of patient vulnerability based on mobility, continence, physical condition, and nutritional status. While these tools facilitate standardized assessment, evidence indicates that they should complement rather than replace professional clinical judgment.

Recent studies suggest that combining standardized assessment tools with comprehensive nursing assessment improves predictive accuracy. Factors such as hemodynamic instability, vasopressor therapy, mechanical ventilation, prolonged surgical procedures, edema, hypoalbuminemia, tissue perfusion, and medical device use are not always fully captured by conventional scoring systems but substantially influence pressure injury risk. Consequently, nurses should integrate assessment scale findings with ongoing clinical observation and individualized patient evaluation when planning preventive care. Routine skin assessment represents another essential nursing responsibility. Comprehensive inspection of bony prominences including the sacrum, heels, hips, elbows, occiput, and shoulders enables nurses to identify early signs of tissue damage before irreversible injury occurs. Persistent non-blanchable erythema, localized warmth, edema, induration, discoloration, or patient-reported discomfort should prompt immediate implementation of intensified preventive interventions. Early detection remains one of the most effective strategies for preventing progression to advanced-stage pressure injuries. Risk assessment should not be considered a one-time event but rather a continuous process integrated into routine nursing care. Changes in mobility, nutritional intake, medical condition, medication use, surgical procedures, or intensive care admission may substantially alter a patient's risk profile within a short period. Continuous reassessment ensures that preventive interventions remain appropriate throughout hospitalization and supports individualized, patient-centered nursing care.

NURSING STRATEGIES FOR PREVENTING PRESSURE INJURIES

Effective prevention of pressure injuries requires a comprehensive, evidence-based approach that integrates multiple nursing interventions rather than relying on a single preventive measure. Current international guidelines emphasize that successful prevention depends on individualized patient assessment, early identification of risk factors, continuous monitoring, multidisciplinary collaboration, and consistent implementation of preventive care bundles. Nurses play a central role in coordinating these interventions because they provide continuous bedside care, monitor changes in patient condition, and ensure adherence to evidence-based clinical protocols.

REPOSITIONING AND EARLY MOBILIZATION

Regular repositioning remains one of the most effective nursing interventions for preventing pressure injuries by reducing prolonged pressure over bony prominences and restoring tissue perfusion. Sustained pressure exceeding capillary closing pressure compromises blood flow, leading to tissue ischemia, hypoxia, and eventually cell death. Scheduled repositioning redistributes pressure, minimizes tissue deformation, and allows adequate oxygen and nutrient delivery to vulnerable tissues. International guidelines recommend individualized repositioning schedules rather than rigid two-hour turning intervals. The frequency of repositioning should be determined according to each patient's mobility, skin condition, support surface, medical stability, and tolerance to movement. Critically ill patients, individuals receiving vasopressor therapy, and patients with spinal cord injuries often require more frequent assessment and repositioning because of impaired tissue perfusion and reduced physiological reserve. During repositioning, nurses should avoid direct pressure on reddened skin, maintain proper body alignment, use positioning devices such as pillows or foam wedges, and minimize friction and shear forces. Early mobilization has emerged as an equally important preventive strategy. Encouraging patients to sit, stand, ambulate, or participate in physical therapy as soon as clinically feasible improves circulation, maintains muscle strength, enhances respiratory function, and reduces prolonged pressure exposure. Collaboration between nurses, physiotherapists, and physicians facilitates individualized mobility plans that promote functional recovery while reducing pressure injury risk.

SKIN ASSESSMENT AND PREVENTIVE SKIN CARE

Comprehensive skin assessment is fundamental to pressure injury prevention because early identification of tissue damage allows prompt intervention before irreversible injury develops. Nurses should perform systematic head-to-toe skin inspections at admission and at regular intervals throughout hospitalization, paying particular attention to bony prominences such as the sacrum, heels, hips, elbows, shoulders, and occiput. Areas beneath medical devices including oxygen masks, cervical collars, splints,

catheters, and compression stockings also require careful examination because device-related pressure injuries have become increasingly common. Assessment should include evaluation of skin color, temperature, moisture, texture, integrity, edema, tenderness, and the presence of persistent non-blanchable erythema. Changes such as localized warmth, hardness, discoloration, or patient complaints of discomfort may indicate early tissue damage before visible ulceration occurs. Accurate documentation enables continuity of care and facilitates communication among multidisciplinary team members.

Routine skin cleansing should be performed using pH-balanced cleansers that preserve the natural skin barrier while avoiding excessive friction during washing or drying. Moisturizers should be applied regularly to maintain skin hydration and reduce dryness, cracking, and susceptibility to injury. Excessive massage over bony prominences is not recommended because it may further damage already compromised tissues. Individualized skin care plans should consider age-related skin changes, chronic diseases, nutritional status, and environmental factors affecting skin integrity.

PRESSURE REDISTRIBUTION SUPPORT SURFACES

Support surfaces play a vital role in reducing pressure intensity and duration among patients unable to reposition independently. Standard hospital mattresses often fail to provide adequate pressure redistribution for high-risk individuals. Consequently, evidence-based guidelines recommend specialized support surfaces for patients identified as being at moderate or high risk of pressure injury development. High-specification foam mattresses, alternating pressure mattresses, low-air-loss beds, and air-fluidized therapy beds redistribute body weight more evenly, reduce tissue compression, and improve microcirculation. Selection of an appropriate support surface depends on patient mobility, body weight, existing skin condition, medical stability, and institutional resources. Nurses are responsible for ensuring correct use of these devices, monitoring their effectiveness, and educating patients regarding their purpose.

Heel protection deserves particular attention because the heels are among the most vulnerable anatomical sites for pressure injury development. Heel suspension devices, specialized boots, foam cushions, or pillows placed beneath the calves effectively relieve pressure from the heels while maintaining proper limb alignment. Nurses should regularly inspect heel skin because tissue damage may progress rapidly, particularly among patients with diabetes mellitus or peripheral vascular disease.

NUTRITIONAL SUPPORT AND HYDRATION

Adequate nutrition is essential for maintaining skin integrity, supporting tissue repair, and preserving immune function. Malnutrition significantly increases susceptibility to pressure injuries because protein

deficiency impairs collagen synthesis, reduces tissue tolerance, delays wound healing, and weakens immune responses. Older adults, critically ill patients, individuals with cancer, and patients experiencing prolonged hospitalization are particularly vulnerable to nutritional deficiencies. Nurses play an essential role in nutritional assessment through routine screening, monitoring dietary intake, recording weight changes, and collaborating with dietitians to develop individualized nutritional plans. Patients identified as being at nutritional risk should receive comprehensive dietary evaluation, protein supplementation when indicated, and adequate caloric intake to support tissue maintenance. Micronutrients including vitamins A, C, E, zinc, and iron contribute to collagen synthesis and immune function and should be optimized whenever deficiencies are suspected. Hydration is equally important because dehydration reduces skin elasticity, impairs circulation, and increases tissue vulnerability to pressure-related damage. Nurses should monitor fluid balance, encourage adequate oral intake whenever possible, recognize early signs of dehydration, and collaborate with physicians regarding intravenous fluid therapy when clinically indicated.

MOISTURE AND INCONTINENCE MANAGEMENT

Excessive moisture weakens the skin barrier, increases friction, promotes microbial growth, and substantially elevates pressure injury risk. Patients experiencing urinary or fecal incontinence, profuse perspiration, wound drainage, or excessive exudate require individualized moisture management strategies to preserve skin integrity. Prompt cleansing following episodes of incontinence, use of pH-balanced cleansers, application of moisture barrier creams, and utilization of absorbent products significantly reduce moisture-associated skin damage. Nurses should avoid excessive rubbing during cleansing and ensure that skin is thoroughly dried before applying protective products. Modern silicone-based barrier films and polymer barrier creams provide prolonged protection while minimizing skin irritation. Comprehensive continence assessment allows early identification of reversible causes of incontinence and supports individualized bladder and bowel management programs. Collaboration with continence specialists, physicians, and physiotherapists further enhances preventive care among patients experiencing chronic incontinence.

PROPHYLACTIC DRESSINGS

Recent evidence supports the use of prophylactic dressings as an adjunctive nursing intervention for patients at high risk of pressure injury development. Multi-layer silicone foam dressings applied to vulnerable anatomical sites such as the sacrum and heels redistribute pressure, reduce shear forces, manage microclimate, and protect superficial tissues from mechanical injury. Several randomized controlled trials have demonstrated that prophylactic dressings significantly reduce hospital-acquired pressure injury incidence when combined with standard preventive measures such as repositioning and

pressure redistribution mattresses. However, dressings should never replace comprehensive preventive care. Nurses should assess dressing integrity regularly, replace dressings according to manufacturer recommendations, and continue routine skin inspection beneath dressing materials.

EDUCATION AND COMPETENCY DEVELOPMENT

Continuous professional education is fundamental to successful pressure injury prevention. Nurses require up-to-date knowledge regarding pressure injury etiology, risk assessment, evidence-based preventive interventions, documentation standards, and emerging clinical technologies. Hospitals that provide regular educational programs, simulation-based learning, competency assessments, and clinical mentoring consistently demonstrate higher compliance with prevention protocols and lower pressure injury rates. Education should extend beyond nursing staff to include patients and family caregivers. Informing patients about the importance of repositioning, mobility, nutrition, hydration, skin inspection, and early reporting of discomfort encourages active participation in preventive care. Family members frequently assist with repositioning and skin observation, particularly among older adults and patients with limited mobility, making caregiver education an important component of comprehensive prevention programs.

MULTIDISCIPLINARY COLLABORATION AND CARE BUNDLES

Pressure injury prevention is most successful when delivered through multidisciplinary collaboration involving nurses, physicians, wound care specialists, dietitians, physiotherapists, occupational therapists, and hospital administrators. Each discipline contributes specialized expertise that enhances individualized patient care while improving adherence to preventive guidelines. Evidence strongly supports the implementation of standardized pressure injury prevention care bundles incorporating structured risk assessment, scheduled repositioning, daily skin inspection, nutritional screening, moisture management, pressure redistribution support surfaces, patient education, and regular documentation. Hospitals implementing these comprehensive bundles consistently report significant reductions in hospital-acquired pressure injuries, demonstrating that coordinated multidisciplinary interventions are considerably more effective than isolated preventive measures. Successful implementation requires strong nursing leadership, organizational commitment, adequate staffing, continuous performance monitoring, and a culture that prioritizes patient safety and evidence-based practice.

EMERGING TECHNOLOGIES, CHALLENGES, IMPLICATIONS FOR NURSING PRACTICE, FUTURE DIRECTIONS, AND CONCLUSION

EMERGING TECHNOLOGIES IN PRESSURE INJURY PREVENTION

Advancements in healthcare technology have transformed pressure injury prevention by enabling early

risk identification, continuous patient monitoring, and evidence-based clinical decision-making. Digital innovations are increasingly being integrated into acute care settings to complement nursing assessment and improve patient safety. Although technology cannot replace clinical judgment, it serves as a valuable adjunct to nursing practice by enhancing the accuracy, efficiency, and consistency of preventive interventions.

Electronic Health Records (EHRs) have become an essential component of modern nursing care. Integration of validated risk assessment tools, such as the Braden Scale, within EHR systems allows automatic identification of high-risk patients immediately after admission. Many healthcare institutions have incorporated computerized clinical decision support systems that generate alerts when reassessment is overdue or when preventive interventions such as repositioning, nutritional consultation, or pressure-relieving support surfaces are indicated. These automated reminders reduce missed assessments and improve adherence to institutional pressure injury prevention protocols. Artificial intelligence (AI) and machine learning are emerging as promising technologies for predicting pressure injury risk with greater accuracy than conventional assessment tools alone. AI algorithms analyze large volumes of patient data, including demographic characteristics, laboratory findings, comorbidities, medication use, mobility status, hemodynamic parameters, and nursing documentation, to identify patients at greatest risk before visible tissue damage develops. Predictive analytics enable healthcare teams to implement individualized preventive interventions earlier, thereby reducing the incidence of hospital-acquired pressure injuries. Pressure-sensing mattresses, wearable sensors, and smart hospital beds provide continuous monitoring of pressure distribution and patient movement. These technologies notify nurses when patients require repositioning, minimizing prolonged pressure exposure and improving compliance with repositioning schedules. Similarly, digital wound photography and telemedicine facilitate remote monitoring by wound care specialists, promoting timely consultation and standardized documentation. Although these innovations improve preventive care, successful implementation depends on adequate staff training, organizational support, and integration into routine nursing workflows.

CHALLENGES IN PRESSURE INJURY PREVENTION

Despite the availability of comprehensive clinical guidelines and technological advancements, pressure injuries continue to occur in acute care settings because of multiple organizational, clinical, and patient-related barriers. One of the most frequently reported challenges is inadequate nurse staffing. High patient-to-nurse ratios limit the time available for comprehensive skin assessments, scheduled repositioning, patient education, and detailed documentation. Heavy workloads often result in delayed implementation of preventive interventions, particularly in intensive care units where patients require

highly complex nursing care. Insufficient knowledge and inconsistent adherence to evidence-based guidelines remain additional barriers. Newly recruited nurses and healthcare personnel may have limited experience with pressure injury prevention protocols, while experienced staff may not receive regular continuing education regarding updated clinical recommendations. Inconsistent competency assessment further contributes to variation in clinical practice across healthcare institutions. Resource limitations also affect preventive care. Many hospitals, particularly in low- and middle-income countries, experience shortages of pressure redistribution mattresses, positioning devices, prophylactic dressings, moisture barrier products, and specialized wound care personnel. Financial constraints may delay procurement of essential preventive equipment despite evidence demonstrating its cost-effectiveness through reduced treatment expenses and shorter hospital stays. Patient-related factors further complicate prevention efforts. Advanced age, severe illness, obesity, spinal cord injury, impaired consciousness, diabetes mellitus, peripheral vascular disease, malnutrition, incontinence, and prolonged immobility substantially increase pressure injury risk despite appropriate nursing interventions. Critically ill patients receiving vasopressor medications often experience compromised tissue perfusion, limiting the effectiveness of repositioning alone. Therefore, prevention requires individualized care plans that integrate multiple interventions tailored to each patient's clinical condition. Documentation deficiencies also represent an important challenge. Failure to accurately record risk assessments, repositioning schedules, skin condition, nutritional status, and implemented interventions reduces continuity of care and limits evaluation of preventive program effectiveness. Standardized electronic documentation systems and regular clinical audits can improve documentation quality and facilitate continuous quality improvement.

IMPLICATIONS FOR NURSING PRACTICE

The findings of this systematic review emphasize that pressure injury prevention is a fundamental nursing responsibility requiring evidence-based clinical decision-making and continuous patient assessment. Nurses should perform comprehensive risk assessments immediately upon admission and repeat evaluations whenever changes occur in the patient's medical condition. Risk assessment should combine validated instruments with professional clinical judgment to ensure individualized preventive care. Routine skin inspection must become an integral component of every nursing assessment. Early recognition of tissue changes enables immediate intervention before irreversible injury develops. Scheduled repositioning, pressure redistribution support surfaces, nutritional optimization, moisture management, and prophylactic dressings should be implemented according to each patient's risk profile rather than through standardized approaches applied uniformly to all patients. Healthcare organizations should invest in continuing professional education, simulation-based competency training, and clinical

mentoring to ensure that nursing staff remain knowledgeable regarding current evidence-based guidelines. Regular clinical audits, performance feedback, and quality improvement initiatives should be incorporated into organizational policies to strengthen compliance with preventive protocols. Establishing multidisciplinary pressure injury prevention teams further improves communication, accountability, and patient outcomes. Nursing administrators should prioritize adequate staffing, availability of specialized equipment, and access to wound care experts to support frontline nurses. Furthermore, fostering a culture of patient safety in which pressure injury prevention is regarded as a shared organizational responsibility encourages consistent implementation of best practices and continuous improvement.

FUTURE DIRECTIONS

Future research should focus on evaluating the long-term effectiveness of emerging technologies such as artificial intelligence, predictive analytics, wearable pressure sensors, and smart support surfaces in diverse healthcare settings. Large multicenter randomized controlled trials are needed to determine the comparative effectiveness of various repositioning schedules, support surfaces, prophylactic dressings, and nutritional interventions among different patient populations. Implementation science research is equally important for identifying strategies that improve adherence to evidence-based clinical guidelines within routine nursing practice. Studies examining organizational culture, leadership, staffing models, and educational interventions will provide valuable insights into sustainable implementation of pressure injury prevention programs. Additional research is also needed in low-resource healthcare settings to identify cost-effective preventive strategies that can be implemented despite financial and infrastructure limitations. Furthermore, greater emphasis should be placed on patient-centered outcomes including quality of life, patient satisfaction, caregiver experiences, and long-term functional recovery following pressure injury prevention interventions. Strengthening international collaboration and standardizing outcome measures will facilitate comparison across studies and support development of globally applicable clinical recommendations.

CONCLUSION

Pressure injuries remain a significant yet largely preventable patient safety challenge in acute care hospitals. Their occurrence is associated with increased morbidity, mortality, prolonged hospitalization, higher healthcare costs, and reduced quality of life. The evidence synthesized in this systematic review demonstrates that nurses play a pivotal role in preventing hospital-acquired pressure injuries through comprehensive risk assessment, regular skin inspection, individualized repositioning, pressure redistribution support surfaces, nutritional optimization, moisture management, patient education, and multidisciplinary collaboration. Rather than relying on isolated interventions, successful prevention

requires the consistent implementation of integrated, evidence-based care bundles tailored to each patient's clinical condition. Validated risk assessment tools such as the Braden, Norton, and Waterlow scales provide valuable guidance for identifying high-risk patients; however, these tools should complement rather than replace professional nursing judgment. Continuous reassessment throughout hospitalization is essential because patient conditions frequently change, particularly in intensive care and surgical settings. Early identification of tissue damage combined with prompt preventive intervention remains the most effective strategy for reducing pressure injury incidence. Emerging technologies, including electronic health records, clinical decision-support systems, artificial intelligence, pressure-monitoring devices, and predictive analytics, offer promising opportunities to strengthen preventive care by improving early detection and supporting evidence-based clinical decision-making. Nevertheless, successful integration of these technologies depends upon adequate infrastructure, organizational commitment, ongoing professional education, and effective nursing leadership. Despite substantial progress in pressure injury prevention, important challenges remain, including inadequate staffing, limited healthcare resources, inconsistent adherence to evidence-based guidelines, and increasing patient complexity. Addressing these barriers requires sustained investment in nursing education, workforce development, quality improvement initiatives, and multidisciplinary collaboration. Healthcare organizations should establish standardized prevention protocols, conduct regular clinical audits, and promote a culture of patient safety in which pressure injury prevention is recognized as a shared responsibility among all healthcare professionals.

REFERENCES

1. Chou, R., Dana, T., Bougatsos, C., Blazina, I., & Starmer, A. J. (2013). Pressure ulcer risk assessment and prevention: A systematic comparative effectiveness review. *Annals of Internal Medicine*, 159(1), 28–38. <https://doi.org/10.7326/0003-4819-159-1-201307020-00006>
2. Gould, L. J., Alderden, J., Aslam, R., Barbul, A., Bogie, K. M., El Masry, M., Graves, L. Y., White-Chu, E. F., & Wound Healing Society Guideline Working Group. (2024). WHS guidelines for the treatment of pressure ulcers—2023 update. *Wound Repair and Regeneration*, 32(1), 6–33. <https://doi.org/10.1111/wrr.13130>
3. Li, Z., Lin, F., Thalib, L., & Chaboyer, W. (2020). Global prevalence and incidence of pressure injuries in hospitalized adult patients: A systematic review and meta-analysis. *International Journal of Nursing Studies*, 105, 103546. <https://doi.org/10.1016/j.ijnurstu.2020.103546>
4. Lyu, Y., Huang, Y.-L., Li, Z.-Y., & Lin, F. (2023). Interventions and strategies to prevent medical device-related pressure injury in adult patients: A systematic review. *Journal of Clinical Nursing*, 32,

6863–6878. <https://doi.org/10.1111/jocn.16790>

5. Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>
6. Padula, W. V., & Delarmente, B. A. (2019). The national cost of hospital-acquired pressure injuries in the United States. *International Wound Journal*, 16(3), 634–640. <https://doi.org/10.1111/iwj.13071>
7. Pott, F. S., Meier, M. J., Stocco, J. G. D., Petz, F. F. C., Roehrs, H., & Ziegelmann, P. K. (2023). Pressure injury prevention measures: Overview of systematic reviews. *Revista da Escola de Enfermagem da USP*, 57, e20230039. <https://doi.org/10.1590/1980-220X-REEUSP-2023-0039pt>
8. Spruce, L. (2023). Prevention of perioperative pressure injury. *AORN Journal*, 117(5), 317–323. <https://doi.org/10.1002/aorn.13918>
9. VanGilder, C. A., Cox, J., Edsberg, L. E., McNichol, L., & Black, J. (2021). Pressure injury prevalence in acute care hospitals with unit-specific analysis: Results from the International Pressure Ulcer Prevalence Survey. *Journal of Wound, Ostomy and Continence Nursing*, 48(6), 492–503. <https://doi.org/10.1097/WON.0000000000000815>
10. Chaboyer, W., Thalib, L., Harbeck, E. L., Coyer, F., Blot, S., Bull, C. F., & Nogueira, P. C. (2018). Incidence and prevalence of pressure injuries in adult intensive care patients: A systematic review and meta-analysis. *Critical Care Medicine*, 46(11), e1074–e1081. <https://doi.org/10.1097/CCM.00000000000003366>
11. Demarré, L., Van Lancker, A., Van Hecke, A., Verhaeghe, S., Grypdonck, M., Lemey, J., & Beeckman, D. (2015). The cost of prevention and treatment of pressure ulcers: A systematic review. *International Journal of Nursing Studies*, 52(11), 1754–1774. <https://doi.org/10.1016/j.ijnurstu.2015.06.006>
12. Moore, Z. E., & Patton, D. (2019). Risk assessment tools for the prevention of pressure ulcers. *Cochrane Database of Systematic Reviews*, 1, CD006471. <https://doi.org/10.1002/14651858.CD006471.pub4>
13. Kottner, J., Cuddigan, J., Carville, K., Balzer, K., Berlowitz, D., Law, S., Litchford, M., Mitchell, P., Moore, Z., Pittman, J., Sigauco-Roussel, D., & Yee, C. Y. (2019). Prevention and treatment of pressure ulcers/injuries: Clinical practice guideline. *Journal of Tissue Viability*, 28(2), 51–58.



<https://doi.org/10.1016/j.jtv.2019.01.001>

14. Fulbrook, P., Lawrence, P., & Miles, S. (2023). Barriers and facilitators to pressure injury prevention in hospitals: A mixed-methods systematic review. *Journal of Tissue Viability*, 32(3), 355–364.
<https://doi.org/10.1016/j.jtv.2023.04.009>