Choosing a support surface for pressure injury prevention and treatment

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Abstract: This article discusses an evidence- and consensus-based support-surface algorithm designed to help clinicians choose the most appropriate support surface for preventing or treating pressure injuries based on patient, nurse, and institutional considerations.

Keywords: Braden scale; pressure injury; shear stress; support surfaces; WOCN; Wound, Ostomy and Continence Nurses Society

PRESSURE INJURIES are associated with increased morbidity, mortality, length of stay, and healthcare costs. Support surfaces are an integral component of a pressure injury prevention and treatment program because they enhance perfusion in at-risk or injured soft tissue.¹

The evidence shows that pressure redistribution support surfaces can help reduce the incidence of pressure injuries by up to 60%.²⁻⁴ Clinicians across all care settings are expected to make care recommendations for pressure injury prevention and treatment based on current research. However, research related to support surface utilization is very limited, and no particular type or brand of support surface has been shown to be superior to another.^{3,5,6} Currently, clinicians must base product selection on a clear understanding of the therapeutic features of various products and how well they meet the patient's needs.¹

The Wound, Ostomy and Continence Nurses Society (WOCN) recognizes that clinicians want to make quality

decisions regarding the most appropriate choice of support surface for their patients. Often, however, these decisions are based on personal preference and tend to favor products for reasons of reimbursement or availability in the healthcare setting.

After conducting an extensive literature review, WOCN found no evidence-based guidance for choosing the most appropriate support surface based on patient risk and other characteristics.⁷ Consequently, WOCN began the process of developing a valid and reliable web-based algorithm using current best-evidence and consensus-based best practices as a guide for

and institutional factors to consider when implementing the algorithm.

Surfaces that lend support

Patients at high risk for pressure injuries or who currently have pressure injuries should be placed on a support surface rather than on a standard hospital mattress.^{2,3,5,8} Support surfaces are mattresses, overlays, bed systems, and other devices designed to distribute body pressure evenly, reduce shearing forces, and control heat and moisture.⁷ Examples range from low-tech foam cushions and mattresses to more complex equipment such as alternating pressure devices or air-fluidized surfaces.

To develop an algorithm, twenty-one scientists, researchers, and clinicians from North America with expertise in support surface selection in various care settings were called upon to provide feedback on best practices in pressure redistribution support surface selection.

clinical practice. This is available at www.algorithm.wocn.org.⁶ The most reliable evidence was reviewed and used as the basis for the algorithm, then consensus was gained on those areas where valid and reliable data did not exist. Twenty-one scientists, researchers, and clinicians from North America with expertise in support surface selection in various care settings were called upon to provide feedback on best practices in pressure redistribution support surface selection. The result was an evidence- and consensus-based support-surface algorithm that uses the Braden Scale moisture and mobility subscores in its configuration.

This article describes the risk factors considered in the development of the algorithm; the relationship between patient risk factors and choice of support surface; and patient, nurse,

Each type of support surface has advantages, disadvantages, and contraindications. For example, some mattresses and overlays might not be appropriate for patients at risk for falls because of the potential for entrapment. The selection of support surface must be based on a full assessment of the patient's condition and needs, and not solely on the patient's risk for pressure injury.

In addition, support surfaces are not to be used as a stand-alone intervention for the prevention and treatment of pressure injuries. They must be used in conjunction with such interventions as nutritional support, microclimate (moisture and heat) management, and offloading of the heels to relieve pressure.⁹

Assessing risk factors

As described in the current evidence-based clinical practice guidelines, the WOCN support surface algorithm

addresses patient characteristics and risk factors such as:¹⁰⁻¹²

- advanced age. As people age, the epidermis becomes thinner and less cohesion exists between the epidermal and dermal layers of the skin, increasing the risk of skin damage.

- poor dietary intake of protein. Because protein is essential for collagen synthesis, patients who lack adequate protein intake are at a higher risk of poor wound healing. A referral to a registered dietitian may be appropriate for patients who have a Braden nutritional subscale score of less than 3. A Braden nutritional subscale score of less than 3 indicates the patient is consuming inadequate nutrition or has a poor nutritional status.¹⁰

- diastolic pressure less than 60 mm Hg. Hypotension adversely affects perfusion to all major organs, including the skin, placing the patient at additional risk of skin breakdown.

- hemodynamic instability. A critically ill patient may experience a multitude of tissue perfusion and oxygenation problems, including hypovolemia, hypotension, vasoconstriction, edema, and sepsis. These complications also raise the risk of skin breakdown.

- comorbidities. Patients who have one or more comorbidities that adversely affect skin or the ability to heal are at higher risk for skin breakdown. Examples include renal disease, diabetes, cardiovascular disease, pulmonary disease, neuromuscular disease, connective tissue and skin disorders, and immunosuppression.

- history of pressure injuries. A previous pressure injury increases the risk of a new injury, particularly in the area of a previous pressure injury because the tensile strength of a healed full-thickness pressure injury is less than that of intact skin.¹¹

- smoking history. Patients who are current smokers or who have a multiple pack-year history and have quit within the past year are at increased risk of developing a pressure injury due to impaired tissue perfusion.
- generalized edema. The presence of abnormally large amounts of fluid in the interstitial space impairs tissue perfusion.
- anemia. Low serum hemoglobin and hematocrit levels reduce the delivery of oxygen and nutrients to tissues throughout the body, including the skin. This can increase the risk of pressure injury in patients who have been identified at high risk for skin breakdown.
- reduced mobility or activity level. When patients spend most or all of their time in bed and/or cannot reposition themselves while in bed, they are at increased risk for pressure injuries.
- excess moisture on the skin from diaphoresis, urine, feces, or wound drainage. Evidence supports that excessively moist, warm skin can increase the risk of skin breakdown.^{13,14} Microclimate control, a therapeutic function provided by some support surfaces, is a feature that can benefit patients who are diaphoretic or incontinent.^{13,14} Control of temperature at the interface surface (patient-bed boundary) helps to maintain normal skin temperature, which in turn inhibits diaphoresis and reduces skin moisture.¹⁵ An ideal support surface would therefore be designed to help maintain normal skin hydration and temperature.¹⁶ This can be accomplished through porous covers that reduce moisture by promoting air transfer between the skin and surface, dissipating moisture and body heat. Another approach is to provide constant airflow against the skin by pumping air through micro-perforations in the support surface cover.¹⁷

How to use the WOCN support surface algorithm⁶

This web-based clinical decision guide is accessible from any mobile device at <http://algorithm.wocn.org/#home>. Based on evidence and expert consensus, this algorithm facilitates point-of-care decisions by guiding the nurse through a series of assessments to determine the patient's risk of pressure injury. If the patient is at risk, the nurse then answers another series of questions to identify appropriate support surfaces according to the patient's condition. A support surface product formulary is included for reference.

To use the algorithm, click on the appropriate blue box or circle to move on to the next step of the algorithm. At the end of the pathway, the final results are displayed in a green box.

- friction and shear. These physical forces increase the risk of pressure injury formation, with shear being of tremendous significance. *Shear stress* refers to the deformation that occurs when the tissue is exposed to lateral strain.¹⁸ The patient is at risk for shear damage when exposed to the dual forces of friction and gravity. This occurs when the patient slides down in bed; typically, frictional forces hold the skin stationary while gravitational forces cause the deep tissue layers (muscle and bone) to slide down. This causes shear and deformation of the subcutaneous tissue and blood vessels, which is a major contributor to ischemic injury.

Support surfaces with low-friction covers reduce frictional forces and thereby minimize tissue deformation when the patient slides down in bed. An alternative approach is to reduce sliding, but this is very difficult to accomplish in situations requiring head-of-bed elevation. Nurses must remember that a support surface cannot provide total protection against shear and does not eliminate the need for additional interventions to minimize friction and shear.¹⁷

Critical thinking and algorithm use

Optimal decision-making regarding support surfaces is based on a comprehensive assessment. This includes condition and location of

wounds (if applicable), a need for head-of-bed elevation, and a need for microclimate mitigation. Additional nursing assessments include physical activity and positioning limitations, risk for falls and entrapment, body habitus including height and weight, and patient reports of comfort or discomfort.

Not all patient circumstances and risk factors can be reflected on an algorithm. At those moments, a skilled clinical assessment with critical thinking/decision-making is required. The WOCN algorithm offers "Critical Thinking Points" for some of these situations (see *How to use the WOCN support surface algorithm*). For example, suppose a patient has a Braden score of 17 (at risk). If the patient is able to turn from side to side to redistribute pressure, he or she could remain on a standard support surface rather than move to a higher level of support. However, if the patient has a medical condition that prohibits turning to one side (such as shortness of breath, cardiac rhythm changes, or a medical device in place), changing to a different support surface would be indicated because only one turning surface is available for this patient.⁶

Another example requiring critical thinking might involve a patient at risk for a pressure injury to the heels. Support surfaces cannot provide sufficient envelopment

to protect soft tissue of the heel. Consequently, the nurse must initiate interventions to elevate the patient's heels off the bed surface.¹

Key principles and nursing considerations

All patients with existing pressure injuries should be placed on a surface that provides an effective level of pressure redistribution (such as high-density foam, low air loss, alternating pressure, viscoelastic

are available in a specific care setting is critical for minimizing staff confusion, managing costs, and improving access to appropriate and safe products.¹⁹ Considerations for compatibility with care setting include rental versus purchase, product maintenance, safety, and reimbursement. Once these considerations are analyzed, a formulary can be created with a range of products intended to meet the needs of the facility's patient population.¹

Nurses and other staff who have ongoing exposure to support surfaces should cultivate continual awareness of support surfaces and observe for signs of aging or wear, such as reduced height or thickness; discoloration; altered integrity of cover, seams, or zipper/zipper cover flap; and odor.

foam, fluid, or air-fluidized surface). A support surface that dissipates moisture (low air loss) may be indicated for a diaphoretic patient or a patient with copious wound drainage or incontinence not contained by dressings or absorptive products.^{2,3,6}

Nurses and other staff who have ongoing exposure to support surfaces during bedding or room changes should cultivate continual awareness of support surfaces and observe for signs of aging or wear, such as reduced height or thickness; discoloration; altered integrity of cover, seams, or zipper/zipper cover flap; and odor. Do not rely on the product's stated lifespan. Nurses who note signs of wear should refer the surface to engineering/maintenance for testing or evaluation for continued use. Deterioration of the support surface presents a high risk for moisture penetration with potential for infection.⁶

The development and implementation of a standardized formulary describing the support surfaces that

WOCN's evidence- and consensus-based algorithm for support surface selection is an effective guide to nursing practice. Whatever a nurse's role in the healthcare setting, this algorithm can assist with the selection of support surfaces that prevent pressure injuries in at-risk patients and facilitate healing in patients experiencing pressure injuries. ■

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