

Navigating the maze of support surfaces

Learn how support surfaces work to help prevent pressure injuries.

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Support surfaces are valuable tools for reducing pressure injury (PI) development and progression, but choosing the right one can be challenging. Nurses can make a difference in a patient's care by learning how support surfaces—such as mattress overlays, mattress replacements, and specialty beds—redistribute or reduce tissue pressure and prevent PIs from developing or worsening. To understand how support surfaces help, you also need to understand how surfaces might contribute to PIs.

Fearsome forces

Factors that contribute to PIs include pressure, shear, and microclimate. (See *Support surface terms*.)

Pressure

A PI develops when external pressure against the skin exceeds capillary pressure for an extended length of time, resulting in tissue ischemia. It occurs when soft tissue is compressed between a bony prominence and a surface, such as a bed or chair.

Shear

Shear refers to pulling or stretching one part of the body while an adjacent part is pulled or stretched in the opposite direction, damaging both superficial and deep tissues. Shear reduces the tissue's ability to withstand pressure to less than half of its ability without the shear force. In clinical situations, shear occurs when the head of the bed is elevated more than 30 degrees and the patient slides toward the foot of the bed. The patient's skin adheres to the bed linen, while the bony skeleton slides downward, resulting in pulling and stretching of blood vessels and underlying tissue distortion.

Microclimate

Microclimate between the patient's skin and the



support surface includes temperature, humidity, and airflow. Normally, the skin releases heat and moisture into the air, allowing the body to cool itself. Because the outward flow of heat and moisture is inhibited when a patient is on a mattress, both increase at the interface between the skin and mattress. As the temperature rises, the metabolic needs of the skin rise. Moisture build-up weakens the skin and makes it more prone to damage.

For support surfaces to successfully contribute to PI prevention, pressure, shear, and microclimate need to be managed.

Support options

The National Pressure Ulcer Advisory Panel (NPUAP) says a support surface is “a specialized device for pressure redistribution designed for management of tissue loads, microclimate, and/or other therapeutic functions.” The most important role of a support surface is redistribution of pressure on the tissue loads.

Support surface terms

Shear and friction are frequently confused. Shear occurs within the body planes (skeleton, muscle, or subcutaneous tissue), and friction occurs when something slides against the skin. Knowing the terms related to support surfaces will help you understand how they can aid in pressure injury prevention. For additional information visit bit.ly/2H7xZ7b.

Term	Definition
Friction	The resistance to motion in a parallel direction relative to the common boundary of two surfaces.
Coefficient of friction	A measurement of the amount of friction existing between two surfaces.
Envelopment	The ability of a support surface to conform, so that it fits or molds around body irregularities.
Fatigue	The reduced capacity of a surface or its components to perform as specified. Fatigue may be the result of intended or unintended use and/or prolonged exposure to chemical, thermal, or physical forces.
Force	A push-pull vector with magnitude (quantity and direction of pressure and shear) that's capable of maintaining or altering the body's position.
Immersion	Depth of penetration (sinking) into a support surface.
Life expectancy	The defined period of time during which a product can effectively fulfill its designated purpose.
Mechanical load	Force distribution acting on a surface.
Pressure	The force per unit area exerted perpendicular to the plane of interest.
Pressure redistribution	The ability of a support surface to distribute load over the contact areas of the human body. (This term replaces previous "pressure reduction" and "pressure relief surfaces.")
Pressure reduction	This term is no longer used to describe classes of support surfaces. The term is pressure redistribution; see above.
Pressure relief	This term is no longer used to describe classes of support surfaces. The term is pressure redistribution; see above.
Shear	The force per unit area exerted parallel to the plane of interest.
Shear strain	Distortion or deformation of tissue as a result of shear stress.

Source: Used with permission of the National Pressure Ulcer Advisory Panel, 2007.

Components of support surfaces include air, gel, fluid, and foam. Support surface categories include reactive, active, integrated bed systems, nonpowered, powered, overlays, and mattresses. (See *Support surface categories*.)

Therapeutic support surfaces redistribute tissue loads through immersion (depth of the patient's body pressing into the support surface) and envelopment (ability of the surface to conform around the body). As the body surface area contacts the support surface, pressure redistribution occurs.

Foam is the most widely used support surface. Foam surfaces are available in a variety of densities, including basic elastic and viscoelastic. High specification foam is preferred for patients at any risk of injury. Density/hardness defines the foam grade; a high specification mattress has a density of 35 kg/m³, a hardness of 130 N (the higher the newton, the more force needed to compress the mattress, which means it's firmer than one with a lower newton), and a depth of at least 5.9 inches.

But foam isn't always the best choice, or it may not be the only intervention needed. Select support surfaces based on features that best fit the patient's needs. For example, studies have shown that beds or surfaces that are air fluidized, have low air loss, or are powered, are effective for patients at high risk for PI or who have existing injuries. The key is to find the right combination. For example, a powered mattress overlay can reduce skin shear while providing a microclimate that removes excessive heat and moisture.

Choose wisely

In 2014, NPUAP developed these general recommendations for support surface selection and monitoring:

- Select a support surface that meets individual patient needs.
- Choose a support surface compatible with the care setting.
- Examine the appropriateness and functionality of the surface on each encounter with the patient.
- Identify and prevent complications of support surface use.
- Verify the support surface is used within its functional lifespan.
- Reposition the patient regularly.
- Choose devices, incontinence pads, linen, and clothing compatible with the support surface.

Despite these recommendations, selecting a support surface can be challenging because of confusing terminology and standards. Fortunately, you have two excellent resources.

- NPUAP created the Support Surface Standards Initiative (S3I) to help develop uniform support surface terminology, test methods, and reporting standards (bit.ly/2vcA7WP).
- The Wound Ostomy Continence Society created an evidence- and consensus-based algorithm for support surface selection. Instructions for the algorithm are provided in a free education module (wocn.org/?page=SSA).

Monitoring and more

Your work isn't done after support surfaces are selected and placed. You must monitor the system to ensure it's working properly and assess patients vigilantly. A change in patient condition may require a change in support surface. Document patient assessments and support surfaces used in the patient's health record and communicate them during patient hand-offs.

A tailored approach

Tailor prevention and treatment interventions to individual patient needs and desires. When selecting an appropriate support surface, consider the patient's PI risk assessment results, level of immobility, need for microclimate control and shear reduction, and his or her size and weight. Also consider the number, severity, and location of existing PIs; the patient's comfort and preference; and surface availability and ease of use. No one surface is ideal for all patients, so use your analytical skills to ensure the optimal fit between the patient and the support surface.

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Selected references

- Call E, Tescher A. S3I Update: New support surface testing standards. Implications for clinical practice. NPUAP Annual Conference: Where Research meets Practice presentation. Las Vegas, March 3, 2018.
- Clark M, Black J. Skin IQ microclimate manager made easy. *Wounds International*. 2011;2(2):1-6. woundsinternational.com/made-easys/view/skin-iq-microclimate-manager-made-easy
- Doughty DB, McNichol LL. Wound, Ostomy and Continence Nurses Society Core Curriculum: *Wound Management*. Wolters Kluwer; Philadelphia; 2015.
- Jordan RS, Phipps S. Understanding therapeutic support surfaces. *Wound Care Advisor*. 2014. woundcareadvisor.com/understanding-therapeutic-support-surfaces-vol3no3/
- Maklebust J. Take the load off by choosing the right support surface. *Nursing*. 2004;Suppl:12-5.
- McInnes E, Jammali-Blasi A, Bell-Syer SE, Dumville JC, Middleton V, Cullum N. Support surfaces for pressure ulcer pre-

Support surface categories

You have options when it comes to support surfaces. When you understand how they work, you can choose the surface that's right for individual patients.

Support surface	Definition
Reactive support surface	A powered or nonpowered support surface with the capability to change its load distribution properties only in response to applied load.
Active support surface	A powered support surface with the capability to change its load distribution properties with or without an applied load.
Integrated bed system	A bed frame and support surface that are combined into a single unit; the surface can't function separately.
Nonpowered	Any support surface that doesn't require or use external energy sources.
Powered	Any support surface that requires or uses external sources of energy.
Overlay	An additional support surface that's placed directly on top of an existing surface.
Mattress	A support surface placed directly on an existing bed frame.

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vention. *Cochrane Database Syst Rev*. 2015;3(9):CD001735.

McNichol L, Watts C, Mackey D, Beitz JM, Gray M. Identifying the right surface for the right patient at the right time: Generation and content validation of an algorithm for support surface selection. *J Wound Ostomy Continence Nurs*. 2015;42(1):19-37.

McNichol L, Watts, Mackey D, Beitz J, Gray M, Carchidi C. Choosing a support surface to prevent pressure ulcers: An evidence-based algorithm aids selection. *Am Nurse Today*. 2015;10(11):13-4.

National Pressure Ulcer Advisory Panel. Terms and definitions related to support surfaces. 2007. npuap.org/wp-content/uploads/2012/03/NPUAP_S3I_TD.pdf

National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance; Haesler E (ed). *Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline*. 2014; Osborne Park, Western Australia; Cambridge Media.

Serraes B, Beeckman D. Static air support surfaces to prevent pressure injuries: A multicenter cohort study in Belgian nursing homes. *J Wound Ostomy Continence Nurs*. 2016;43(4):375-8.

Serraes B, van Leen M, Schols J, Van Hecke A, Verhaeghe S, Beeckman D. Prevention of pressure ulcers with a static air support surface: A systematic review. *Int Wound J*. 2018 [Epub ahead of print.]

Stone A, Brienza D, Call E, et al. Standardizing support surface testing and reporting: A National Pressure Ulcer Advisory Panel executive summary. *J Wound Ostomy Continence Nurs*. 2015;42(5):445-9.