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Integrated Therapeutic Support Surface Selection for Pressure Injury Prevention and Management

Fundamental Principles and Assumptions

- Therapeutic support surfaces are an important part of 24-hour pressure injury prevention and management. No one category of therapeutic support surface performs better than another,[1,2] therefore appropriate support surface selection must include assessment of risk factors, comfort, ease of use, individual preference, pain management, sleep patterns and need for resources for turning and repositioning.[3,4]
- Therapeutic support surfaces, even a lateral rotation surface, are not a replacement for a turning and repositioning schedule.[5-7] An individual risk and skin assessment should determine whether repositioning frequency needs to be increased or decreased.[5,6]
- Cultural preference: Embracing the patient's cultural preferences is part of planning for selection of a therapeutic support surface (e.g., Two-eyed Seeing principles).[8,9]
- All surfaces can be categorized using the standard definitions.[10] The generic support surface terms (e.g., reactive multi-zoned surface) includes both surfaces that are commercially available and constructed surfaces relevant to the person's personal and cultural context. This includes assessing for immersion (how far the individual sinks into the surface)[11] and envelopment (how well the material conforms to the individual's body).[11] For this reason layers of linen should be minimized[12-14] as it interferes with immersion and envelopment.
- The number of pressure injuries the person has is more relevant to support surface selection than stage of wound because the more wounds the person has, the fewer options they may have for positioning that offloads the wound. For example, a patient with one Stage 4 pressure injury may be able to be positioned in several different ways to offload the wound.
- The person's mobility and independence should be promoted and preserved wherever possible.[5,6]
- Prescribed bed rest is not best practice for the prevention and management of pressure injuries.[6,15-17] The provision of a support surface in bed is only part of the strategy, as other surfaces upon which the person sits, lies or transfers to /from also need ongoing assessment.[6,18,19]
- Follow the steps in Wounds Canada's Wound Prevention and Management Cycle.[20]
- Surface manufacturers and complex rehabilitation technology providers (vendors) are part of the pressure injury prevention team. They can assist with the categorization of support surfaces and provide education on each product.
- Some support surfaces, such as hybrid surfaces, come with more than one feature—such as alternating air and rotation—and are not necessarily better; clinical judgment based on the relevant person factors needs to be used.
- When using an overlay or therapeutic support surface, the health-care provider must ensure the support surface-bed frame combination falls within the National Entrapment guidelines.[21,22] Health-care providers should work with the manufacturer to mitigate risks. **Note:** Powered air mattress replacements (such as those with low air loss), may pose an additional risk of entrapment because these surfaces tend to compress, causing an increase in space in the zones of entrapment. Therefore, these surfaces should only be used when the benefit of the surface outweighs the risk of entrapment.[21]

Definitions

Active surface: Powered support surface that has the ability to change its load distribution properties with or without an applied load

Alternating pressure: Feature that provides pressure redistribution via cyclic changes in loading and unloading (i.e., inflation and deflation of air-filled cells) as characterized by frequency, duration, amplitude and rate of change parameters

Envelopment: How well the material conforms to the individual's body[11]

Hybrid surface: Marries the benefits of reactive and active support surfaces that can be used in a static mode for constant low air pressure or dynamic mode delivering alternating pressure

Immersion: How far the individual sinks into the surface[11]

Low air Loss: A feature where air is circulated beneath a water vapor permeable cover to control the humidity (microclimate) at the interface between the individual and the support surface

Overlay: An additional support surface designed to be placed directly on top of an existing surface

Pulsation: A feature that provides repeating higher and lower pressures resulting in cyclic changes in stiffness of the surface, typically with shorter duration inflation/deflation, higher frequency and lower amplitude than alternating pressure

Reactive surface: Powered or non-powered support surface with the ability to change its load distribution properties only in response to an applied load

Therapeutic support surface: Specialized devices for pressure redistribution designed for management of tissue loads, microclimate, and/or other therapeutic functions.

Two-eyed seeing: Principles that embrace multiple perspectives; learning from the strengths of Indigenous ways of knowing with one eye, and from the other eye the strengths of the Western ways of knowing used together for the benefit of all; developed by the teachings of Chief Charles Labrador of Acadia First Nation[8] and brought forward by Elders Albert and Murdena Marshall.[9]

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Choosing an Appropriate Therapeutic Support Surface

Step 1: Identify the individual's risk of developing a pressure injury, using a validated risk assessment tool. If the person has a pressure injury, count the number of pressure injuries, excluding the heels (heels are excluded because the evidence suggests heels need to be managed separately, especially since the heels do not always end up in the heel section of the bed).[23]

Step 2: Assess the individual's bed mobility and categorize it as independent (with or without an assistive device), moderate assistance or total assist to change position in bed. Remember independence and mobility as part of the choice of a surface.

Step 3: Follow Table 1: Validated Risk Assessment Category or Pressure Injury (PI) Description. Locate the column with the individual's risk assessment results or number of pressure injuries. Find the row with the individual's level of mobility. The intersection of this column with this row identifies whether to start on the reactive or active support surface portion of the decision tree (Figure 1).

Step 4: Go to Figure 1: Support Surface Decision Tree. Start from either the reactive support surface box or active support surface box depending on the result from Table 1.

Step 5: Follow the yellow considerations boxes and follow the line with the most true answers to the next decision box until you reach the generic description of the surface most appropriate for the individual. Using this information make your selection based on Table 2: Support Surface Selection.

Step 6: Follow the Wound Prevention and Management Cycle in Foundations of Best Practice for Skin and Wound Management: Best Practice Recommendations for the Prevention and Management of Wounds and reassess the individual's needs using the principles outlined in Step 1. Skin changes, pain and/or nausea should also trigger a reassessment of the support surface. Note: Active support surfaces have been reported to cause nausea in some individuals.

Table 1: Therapeutic Support Surface Selection Table use this table to determine where to start in the algorithm. (This table should not be used in isolation)

	Risk Level (based on assessment with a validated tool)	At Risk Or Skin changes likely caused by pressure (See *)	Moderate Risk Or One pressure injury (excluding the heels) where the person can be positioned off the PI	High Risk Or One pressure injury (excluding the heels) and changes over another area	Very High Risk Or Multiple pressure injuries (excluding the heels) or the person cannot be positioned off an ulcerated area
Ability to change position in bed	Total assist needed to change position in bed	Reactive Support Surface	Reactive Support Surface	Reactive or Active Support Surface	Reactive or Active Support Surface
	Moderate assistance with bed mobility required	Reactive Support Surface	Reactive Support Surface	Reactive or Active Support Surface	Reactive or Active Support Surface
	Independent with or without a device with bed positioning (light assist may be required)	Reactive Support Surface	Reactive Support Surface	Reactive Support Surface	Reactive or Active Support Surface

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*Skin changes likely caused by pressure can include:

- Localized heat (skin temperature)[10,11], edema and change in tissue consistency in relations to surrounding tissue (e.g., induration and hardness)[23,24]
- Hyperpigmentation (increased pigmentation) or hypopigmentation (reduced pigmentation)[25,26,27]
- Skin Irritation, rash[26,27]
- Inflammation[24]
- Non-blanchable erythema[26,27]
- Results from emerging technology[28] and thermography[29]
- The production and concentration of melanin in the epidermis (top layer of skin) is greater in dark skin, and the melanin prevents the blanching response. Assessment should include awareness of skin tone in order to monitor any changes to the patient's skin. In all wound types and skin conditions, it is important to be aware of how signs and symptoms may present in a range of skin tones.
- Inflammation, a key factor in pressure injury development, is very strongly related to pain.[24] The pathophysiological links between pressure ulcers and pain and the role of the support surface in mitigating both.[27]
- When assessing darkly pigmented skin, consider assessment of skin temperature and subepidermal moisture as important adjunct assessment strategies.[26]
- Localized heat, edema and change in tissue consistency in relation to surrounding tissue (e.g., induration/hardness) have all been identified as warning signs for pressure injury development.[23]

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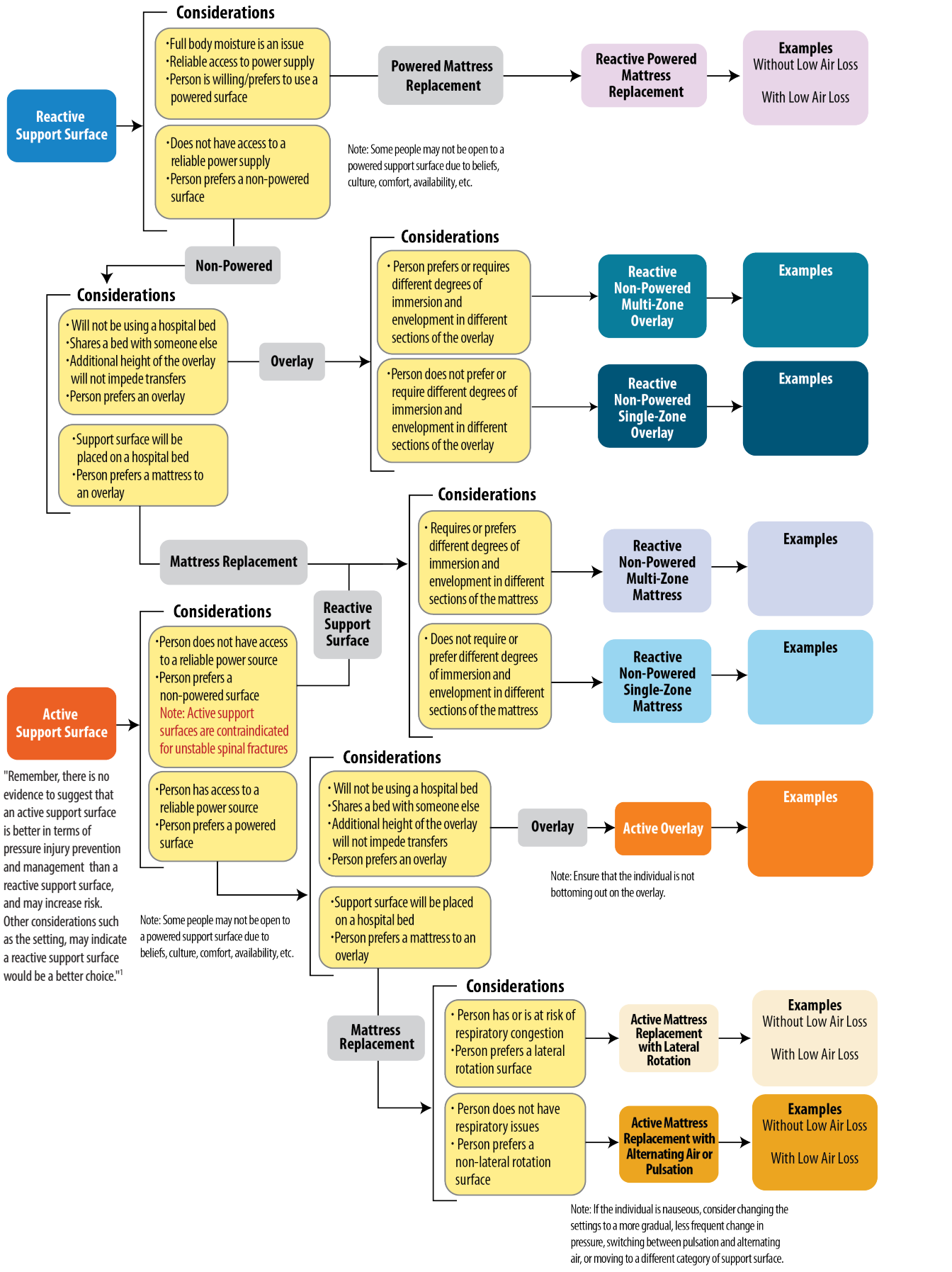
Figure 1: Support Surface Decision Tree



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Note:
- Work in partnership with your manufacturer and complex rehab technology providers (vendors) to populate the example boxes with support surfaces available in your settings.
- Compare surfaces within each example box using the NPIAP comparison tool to provide a data-driven comparison.

Note:
- Low air loss (LAL) is a feature that can be added to powered active and powered reactive surfaces. The role of LAL is to help evaporate moisture and can be considered where full body moisture is an issue. Consult a registered dietitian regarding the potential for insensible fluid loss (dehydration). Due to the nature of these surfaces, strict cleaning protocols are recommended.[25] If low air loss is needed, consider the layers of linen between the surface and the client.
- Transfer borders (usually made from foam) are available on some mattresses and should be considered for individuals who transfer independently or who sit on the edge of the bed.
- Always consider the risk of bed entrapment when adding an overlay or using a therapeutic support surface.[21]

Table 2: Support Surface Selection

Support Surface	Description	Care Considerations	Examples from Your Setting
Reactive Support Surfaces			
Reactive single zone overlay (non-powered) e.g., Convoluted foam overlay	Used on top of the individual's full mattress, one consistent pressure-distribution material throughout	☐ Individual wants to remain in their current, non-hospital bed ☐ Transfer not impacted by the increased mattress to floor height ☐ Does not require different pressure distribution material in different sections	
Reactive multi-zone overlay (non-powered) e.g., 4 sections of an inflated air mattress	Used on top of the individual's full mattress, with different pressure-distribution materials in different sections of the overlay	☐ Individual wants to remain in their current, non-hospital bed ☐ Transfer not impacted by the increased mattress to floor height ☐ Requires different pressure distribution materials in different sections	
Reactive single-zone mattress replacement e.g., Foam mattress with the same density throughout	Replaces the individual's current mattress, usually used on a hospital bed frame, with one consistent pressure-distribution material throughout	☐ Has an appropriate bed frame ☐ Requires one consistent pressure distribution-material throughout ☐ Requires floor-to-mattress height to remain consistent	
Reactive multi-zone mattress replacement e.g., Foam mattress with different densities in different sections	Replaces the individual's current mattress, usually used on a hospital bed frame, with one consistent pressure distribution material throughout	☐ Has an appropriate bed frame ☐ Requires different pressure-distribution material in different sections of the mattress ☐ Requires floor-to-mattress height to remain consistent	

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Reactive mattress replacement (powered) **Without low air loss** e.g., Powered air mattress with a continuous low pressure (non low air loss) **With low air loss** e.g., As above with the addition of air flowing under the cover to evaporate moisture	Powered air mattress with continuous low pressure	☐ Has an appropriate bed frame ☐ Has a reliable power supply ☐ Prefers an air bed ☐ May require assistance for transfers	**Without low air loss** **With low air loss**
Active Support Surfaces			
Active alternating air overlay e.g., An overlay where parts of the mattress will increase in pressure, while others decrease (up and down)	Used on top of the individual's regular mattress, attached to a pump. Some cells increase in pressure while others decrease (up and down) to redistribute pressure in an alternating pattern.	☐ Individual wants to remain in their current, non-hospital bed ☐ Transfer not impacted by the increased mattress-to-floor height Has a reliable power supply	
Alternating air mattress **Without low air loss** e.g., Mattress cells will increase in pressure, while others decrease (up and down) **With low air loss** e.g., As above with the addition of air flowing under the cover to evaporate moisture	Replaces the individual's mattress, usually used on a hospital bed frame. Some cells increase in pressure while others decrease (up and down) to redistribute pressure in an alternating pattern.	☐ Has an appropriate bed frame ☐ Has a reliable power supply ☐ May require assistance for transfers Contraindications •unstable spinal fracture •individual feels nauseous on the surface	**Without low air loss** **With low air loss**
Pulsation **Without low air loss** e.g., Mattress cells will increase in pressure, while others decrease (up and down) **With low air loss** e.g., As above with the addition of air flowing under the cover to evaporate moisture	Repeating higher and lower pressure across the mattress in a smaller volume than alternating air, but more frequent.	☐ Has an appropriate bed frame ☐ Has a reliable power supply ☐ May require assistance for transfers Contraindications •unstable spinal fracture •individual feels nauseous on the surface	**Without low air loss** **With low air loss**
Lateral rotation **Without low air loss** e.g., Mattress that helps to turn the patient **With low air loss** e.g., As above with the addition of air flowing under the cover to evaporate moisture	Replaces the individual's mattress, usually used on a hospital bed frame. Mattress inflates and deflates in sections to laterally turn the individual or assist the individual to be laterally turned.	☐ Has an appropriate bed frame ☐ Has a reliable power supply ☐ Has or is at risk for pulmonary complications ☐ May require assistance for transfers Contraindications •unstable spinal fracture •individual feels nauseous on the surface	**Without low air loss** **With low air loss**

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For additional information on available pressure-reducing/redistribution equipment please see the following sections of the Medical Supplies and Equipment Guide and Benefit Lists for First Nations and Inuit from the Government of Canada:

- Self-care equipment and supplies benefits list (E.g., 9.3 Cushions and protective aids, heel protector, elbow protector, ring cushion, positioning wedge).
- Mobility equipment and supplies benefits list (E.g., 11.7.2 Seat cushion, wheelchair cushions).
- Assistive Technology Funding & Service Programs in Canada.

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