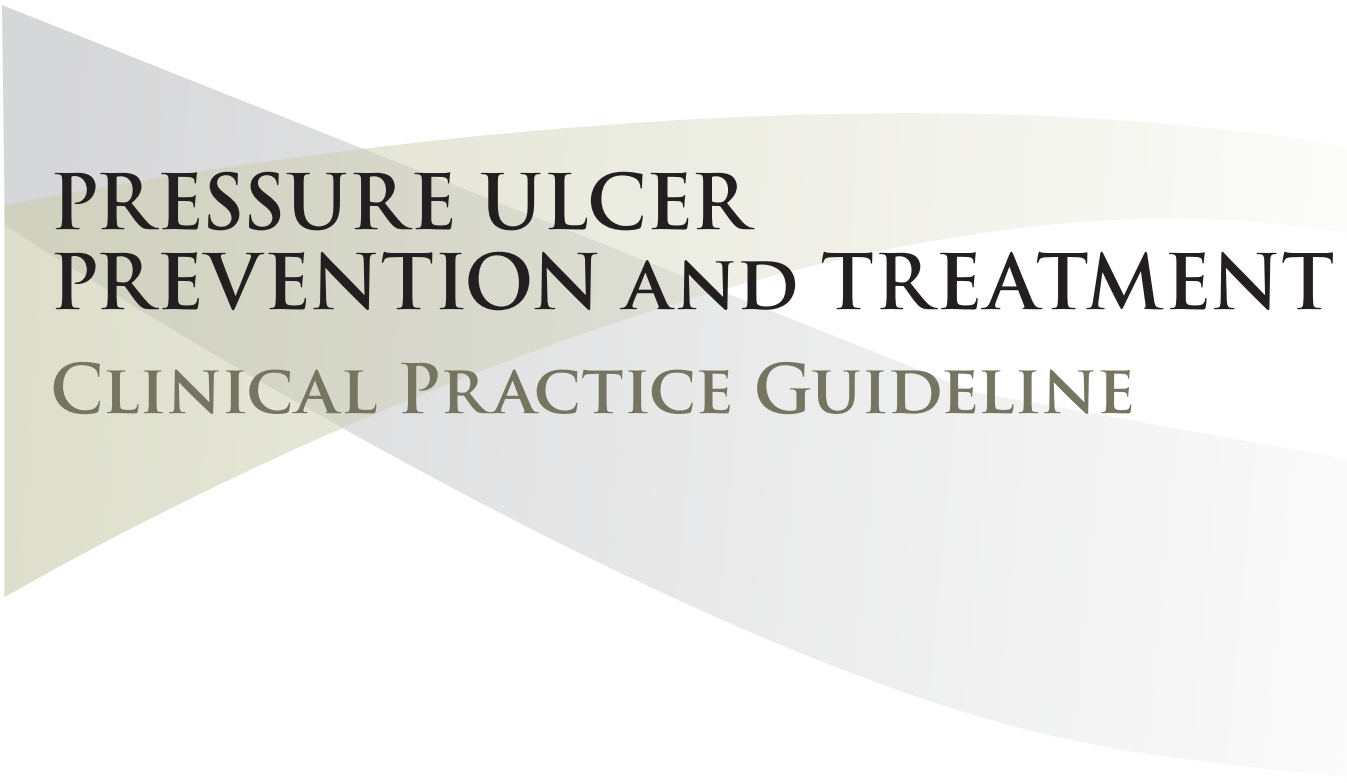


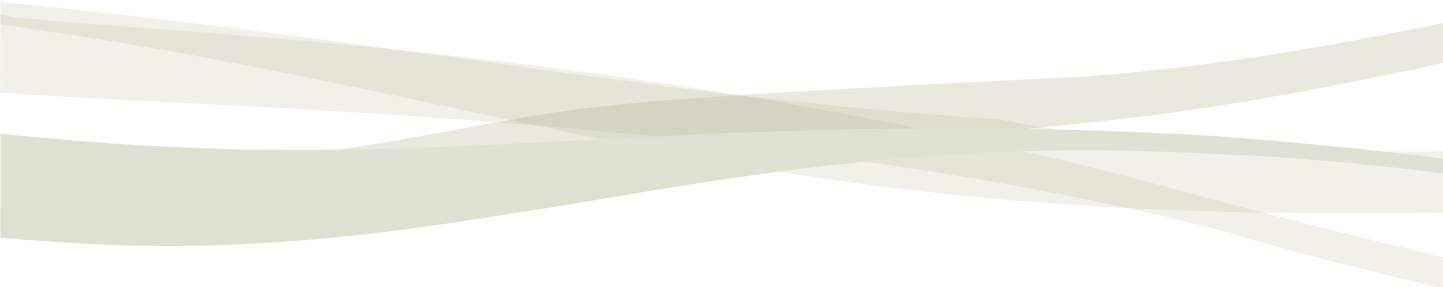
PRESSURE ULCER PREVENTION AND TREATMENT CLINICAL PRACTICE GUIDELINE



Winnipeg Regional
Health Authority
Caring for Health

Office régional de la
santé de Winnipeg
À l'écoute de notre santé

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INTRODUCTION

Regional wound care recommendations relative to the prevention and management of pressure ulcers were first released in 2003 and subsequently updated in 2006. An interdisciplinary work group wrote a document to guide the use of Therapeutic Support Surfaces in 2003. In 2010, an interprofessional and intersectoral editorial working group was established to revisit the evidence for both pressure ulcers and therapeutic support surfaces, and produce a single clinical practice guideline to address both areas.

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METHODOLOGY

A comprehensive literature review was conducted to identify currently published systematic reviews, meta-analyses, and clinical practice guidelines related to both pressure ulcers and therapeutic support surfaces. From this review, promising clinical practice guidelines which included a quick reference guide developed by the European Pressure Ulcer Advisory Panel (EPUAP) and North American Pressure Ulcer Advisory Panel (NPUAP) in 2009 were identified.

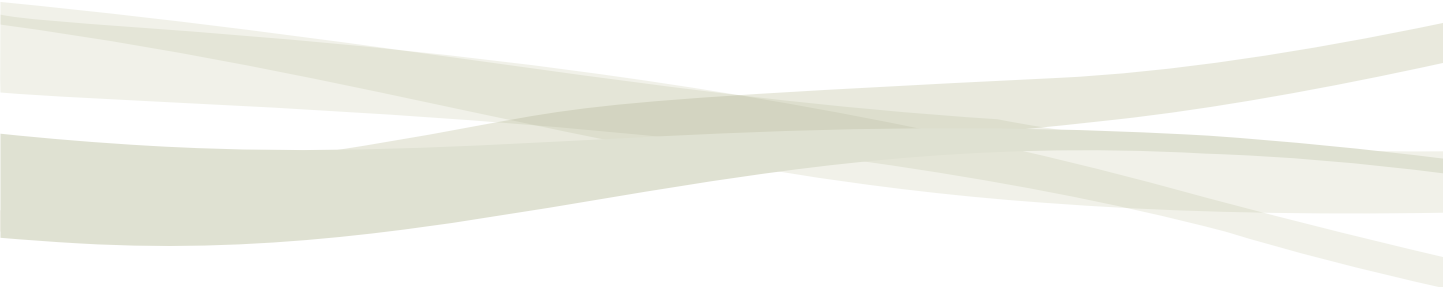
In order to objectively assess the quality of the Clinical Practice Guideline (CPG), the Appraisal of Guidelines for Research and Evaluation (AGREE) Tool was used. The AGREE tool is a reliable and valid instrument designed specifically to provide a framework for assessing the quality of clinical practice guidelines. Based on the results of the AGREE tool, the Pressure Ulcer and Therapeutic Support Surface (PU/TSS) Editorial Group independently agreed to adopt the majority of EPUAP and NPUAP (2009) Quick Reference Guide (QRG) and modify some content to reflect current context and local expertise. The two editorial groups subsequently merged. Permission for use was obtained from the EPUAP and NPUAP to adopt and adapt accordingly.

The EPUAP/NPUAP QRG was based on a more comprehensive CPG that provides a detailed analysis and discussion of available research, critical evaluations of the assumptions and knowledge of the field, a description of the methodology used to develop the guideline, and acknowledgments of editors, authors, and other contributors. Printed copies of the English edition of the CPG are available through the NPUAP website (www.npuap.org) for a fee and the QRG is available in 14 languages, free of charge, on the EPUAP website (www.epuap.org) – under guidelines.

The adaptation was completed by the WRHA PU/TSS Editorial Group between 2010-2012.

Adaptation of the Quick Reference Guide (QRG) included:

- A second literature review to determine if there were relevant publications released subsequent to the release of the EPUAP/NPUAP CPG (i.e. between 2008 to 2011) that would inform the adaptation.
- Librarians from the Neil John Maclean Health Sciences Library, University of Manitoba (Laurie Blanchard, Carol Friesen and Janet Rothney) conducted searches in Embase, PubMed, CINAHL and Scopus to look for new articles (primarily reviews or guidelines) using such search terms as pressure ulcers, therapeutic support surfaces or devices, beds, wheelchairs, overlays, cushions, and other synonyms. Key articles were also searched forward to see if any new articles cited those key references.
- No new studies were found that led to content changes.
- Content changes were made based on expert opinion of members of the WRHA PU/TSS Editorial Work Group to reflect their expertise and local context (often supported by indirect evidence and other guidelines). This is indicated by the statement (WRHA Expert Opinion).
- Stakeholder feedback was solicited through an on-line survey. All stakeholder feedback was reviewed and incorporated at the discretion of the PU/TSS Editorial Work Group based on the congruence of the feedback with the existing evidence.



LIMITATIONS AND APPROPRIATE USE OF THIS GUIDELINE

- Guidelines are systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical conditions. The recommendations may not be appropriate for use in all circumstances.
- The decision to adopt any particular recommendation must be made by the health care professional in light of available resources and circumstances presented by the individual patient. Nothing contained in this guideline is to be considered medical advice for specific cases.
- Because of the rigorous methodology used to develop this guideline, the NPUAP and EPUAP believe that the research supporting these recommendations is reliable and accurate. However, we do not guarantee the reliability and accuracy of individual studies referenced in this document.
- This guideline and any recommendations herein are intended for educational and informational purposes only.
- This guideline contains information that was accurate at the time of publication. Research and technology change rapidly and the recommendations contained in this guideline may be inconsistent with future advances. The health care professional is responsible for maintaining a working knowledge of the research and technological advances that may affect his/her practice decisions.
- Generic names of products are provided. Nothing in this guideline is intended as an endorsement of a specific product.
- Nothing in this guideline is intended as advice regarding coding standards or reimbursement regulations.

PURPOSE AND SCOPE

The purpose of the prevention and management recommendations is to guide evidence-based care for the prevention and management of pressure ulcers. The recommendations will apply to all vulnerable individuals of all age groups. The guideline is intended for the use of health care professionals who are involved in the care of patients and vulnerable people who are at risk of developing pressure ulcers, whether they are in a hospital, long-term care, assisted living at home or any other setting, and regardless of their diagnosis or health care needs. It will also help to guide patients and caregivers on the range of prevention and management strategies that are available. Based on the results of a gap analysis of existing pressure ulcer treatment guidelines, recommendations regarding the unique needs of several special populations have been addressed where evidence exists. These include spinal cord injured individuals, critically ill patients, bariatric patients, and patients in the operating room.

LEVEL OF EVIDENCE FOR INDIVIDUAL STUDIES

Level

1. Large randomized trial (s) with clear-cut results (and low risk of error)
2. Small randomized trial (s) with uncertain results (and moderate to high risk of error)
3. Non randomized trial (s) with concurrent or contemporaneous controls
4. Non randomized trial (s) with historical controls
5. Case series with no controls. Specify number of subjects.

Adapted from Sackett, 1989. See the Clinical Practice Guideline for a discussion of the guideline development methodology.

STRENGTH OF EVIDENCE RATING FOR EACH RECOMMENDATION

Strength of Evidence

- A The recommendation is supported by direct scientific evidence from properly designed and implemented controlled trials on pressure ulcers in humans (or humans at-risk for pressure ulcers), providing statistical results that consistently support the guideline statement (Level 1 studies required).
- B The recommendation is supported by direct scientific evidence from properly designed and implemented clinical series on pressure ulcers in humans (or humans at-risk for pressure ulcers), providing statistical results that consistently support the recommendation. (Level 2, 3, 4, 5 studies)
- C The recommendation is supported by indirect evidence (e.g., studies in normal human subjects, humans with other types of chronic wounds, animal models) and/or expert opinion.

This clinical practice guideline is based on the current research and will need revision in the future as new evidence is published. Future research should focus on the areas where evidence is absent or weak.

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PRESSURE ULCER PREVENTION, ASSESSMENT AND MANAGEMENT ALGORITHM

Braden Scale completed within 24 hours of admission.
 Reassess risk using either the Braden Scale or Minimum Data Set at regularly scheduled intervals. Frequency of reassessment is dependent on patient condition, health care setting, and institutional/program policy

At Risk but No Pressure Ulcer

At Risk and Pressure Ulcer Present

ASSESSMENT/DIAGNOSIS

- Complete History
- Nutritional Assessment
- Investigations
- Wound Assessment

TREAT THE CAUSE

- Preventative Skin Care
- Pressure Management
- Turning and Positioning
- Minimize Friction and Shear
- Manage Moisture
- Maximize Nutrition
- Enhance Mobility and Activity
- Treat Underlying Medical Conditions
- Ensure Quality Education and Communication

TREAT PATIENT CONCERNS

- Manage pain
- Provide emotional support
- Provide patient and family education
- Assess and consider financial situation

Refer to:
Recommendations on care of wound bed

TREAT THE WOUND

- If no healing evidenced within 2-4 weeks with optimal patient and wound management or if wound deteriorates, modify treatment plan and/or consult *advanced wound clinician*

Refer to:
Recommendations on care of wound bed

SUMMARY OF RECOMMENDATIONS

PRESSURE ULCER PREVENTION	
Recommendation	Level of Evidence
Risk Assessment	
1. Establish a risk assessment policy in all health care settings.	(Strength of Evidence = C)
2. Educate health care professionals on how to achieve an accurate and reliable risk assessment.	(Strength of Evidence = B)
3. Document all risk assessments.	(Strength of Evidence = C)
4. Use a structured approach to risk assessment to identify individuals at risk of developing pressure ulcers. The WRHA recommends the use of the Braden Scale or the Pressure Ulcer Risk Scale (embedded in the Minimum Data Set (MDS); an electronic assessment tool used by home care and long term care).	(Strength of Evidence = C)
5. Use a structured approach to risk assessment that includes assessment of activity and mobility.	(Strength of Evidence = C)
6. Use a structured approach to risk assessment that includes a comprehensive skin assessment to evaluate any alterations to intact skin.	(Strength of Evidence = C)
6.1. Consider individuals with alterations to intact skin to be at risk of pressure ulcer development.	(Strength of Evidence = C)
7. Use a structured approach to risk assessment that is refined through the use of clinical judgment informed by knowledge of key risk factors.	(Strength of Evidence = C)
8. Consider the impact of the following factors on an individual's risk of pressure ulcer development: a) Friction and shear; b) Sensory perception and mobility; c) Nutritional indicators; d) Factors affecting perfusion and oxygenation; e) Skin moisture; f) Skin temperature; g) Advanced age; h) Previous history of pressure ulcers	(Strength of Evidence = C)
9. Conduct a structured risk assessment on admission, and repeat as regularly and as frequently as required by the individual's condition. Reassessment should also be undertaken if there is any change in condition.	(Strength of Evidence = C)
10. Develop and implement a prevention plan when individuals have been identified as being at risk of developing pressure ulcers.	(Strength of Evidence = C)
Skin Assessment	
11. Ensure that a complete skin assessment is part of the risk assessment screening policy in place in all health care settings.	(Strength of Evidence = C)
12. Educate professionals on how to undertake a comprehensive skin assessment that includes the techniques for identifying blanching response, localized heat, edema, and induration (hardness).	(Strength of Evidence = B)
13. Inspect skin at least daily for signs of redness in individuals identified as being at risk of pressure ulceration. The frequency of inspection may need to be increased in response to any deterioration in overall condition.	(WRHA Expert Opinion) (Strength of Evidence = C)
14. Skin inspection should include assessment for localized heat, edema, or induration (hardness), especially in individuals with darkly pigmented skin.	(Strength of Evidence = C)

Recommendation	Level of Evidence
15. Ask individuals to identify any areas of discomfort or pain that could be attributed to pressure damage.	(Strength of Evidence = C)
16. Observe the skin to ensure that medical devices are not causing pressure damage.	(Strength of Evidence = C)
17. Document all skin assessments, noting details of any pain possibly related to pressure damage.	(Strength of Evidence = C)
Skin Care	
18. Whenever possible, do not turn the individual onto a body surface that is still reddened from a previous episode of pressure loading.	(Strength of Evidence = C)
19. Do not use massage for pressure ulcer prevention	(Strength of Evidence = B)
20. Do not vigorously rub skin that is at risk for pressure ulceration.	(Strength of Evidence = C)
21. Use skin emollients to hydrate dry skin in order to reduce risk of skin damage.	(Strength of Evidence = B)
22. Protect the skin from exposure to excessive moisture with a barrier product in order to reduce the risk of pressure damage.	(Strength of Evidence = C)
23. For individuals incontinent of urine and/or bowel identify and treat the cause when possible. Otherwise implement a toileting routine to reduce the incidence of incontinence.	WRHA Expert Opinion (Strength of Evidence = C)
24. Implement a structured perineal skin care program for individuals incontinent of urine and/ or feces.	WRHA Expert Opinion (Strength of Evidence = C)
Nutrition for Pressure Ulcer Prevention	
25. Screen and assess the nutritional status of every individual at risk of pressure ulcers in each health care setting.	(Strength of Evidence = C)
26. Establish a nutritional screening policy in place in all health care settings, along with recommended frequency of screening for implementation.	(Strength of Evidence = C)
27. Refer each individual with nutritional risk and pressure ulcer risk to a registered dietitian and also, if needed, to a multidisciplinary nutritional team that includes a registered dietitian, a nurse specializing in nutrition, a physician, a speech and language therapist, an occupational therapist, and when necessary a dentist.	(Strength of Evidence = C)
27.1. Provide nutritional support to each individual with nutritional risk and pressure ulcer risk, following the nutritional cycle. This should include: • Nutritional assessment • Estimation of nutritional requirements • Comparison of nutrient intake with estimated requirements • Provide appropriate nutrition intervention, based on appropriate feeding route • Monitoring and evaluation of nutritional outcome, with reassessment of nutritional status at frequent intervals while an individual is at risk.	(Strength of Evidence = C)
27.2. Follow relevant and evidence based guidelines on enteral nutrition and hydration for individuals at risk of pressure ulcers, who show nutritional risks or nutritional problems.	(Strength of Evidence = C)

Recommendation	Level of Evidence
27.3. Offer each individual with nutritional risk and pressure ulcer risk a minimum of 30-35 kcal per kg body weight per day, with 1.25-1.5 g/kg/day protein and 1ml of fluid intake per kcal per day.	(Strength of Evidence = C)
28. Offer high-protein mixed oral nutritional supplements and/or tube feeding, preferably <u>in addition to the usual diet</u> , to individuals with nutritional risk and pressure ulcer risk because of acute or chronic diseases, or following a surgical intervention.	(Strength of Evidence = A)
28.1 Administer oral nutritional supplements and/or tube feeding in between the regular meals to avoid reduction of normal food and fluid intake during regular mealtimes.	(Strength of Evidence = C)
REPOSITIONING FOR THE PREVENTION OF PRESSURE ULCERS	
General Repositioning	
29. The use of repositioning should be considered in all at-risk individuals.	(Strength of evidence = C)
29.1. Repositioning should be undertaken to reduce the duration and magnitude of pressure over vulnerable areas of the body.	(Strength of evidence = A)
29.2. Continue to reposition the individual regardless of the support surface in use. Establish repositioning frequency based on the characteristics of the support surface and the individual's tissue response.	(Strength of Evidence = C)
29.3. Avoid subjecting the skin to shear forces.	(Strength of Evidence = C)
29.4 Do not drag the individual while repositioning or transferring. Use a friction reducing slider or mechanical lifting device if assistance is required for moving.	(Strength of Evidence = C)
29.5. Do not position the individual directly onto medical devices, such as tubes or drainage systems.	(Strength of Evidence = C)
29.6. Avoid positioning the individual on bony prominences with existing non-blanchable erythema.	(Strength of Evidence = C)
29.7. Consider consulting OT and/or PT for individuals who have limited mobility, spasticity or abnormal muscle tone and do not have the ability to independently reposition themselves in bed or in a chair. An increase in activity should be facilitated as tolerated.	WRHA Expert Opinion (Strength of Evidence = C)
BED REPOSITIONING	
Repositioning Frequency	
30. Frequency of repositioning will be influenced by variables concerning the individual (Strength of Evidence = C) and the support surface in use. (Strength of Evidence = A)	(Strength of Evidence = C) (Strength of Evidence = A)
30.1. Repositioning frequency will be determined by the individual's tissue tolerance, their level of activity and mobility, their general medical condition, the overall treatment objectives, and assessments of the individual's skin condition and the type of support surface in use. Individuals should be turned every two hours until a personalized schedule is established.	(Strength of Evidence = C)
30.2. Assess the individual's skin condition and general comfort with each repositioning. If the individual is not responding as expected to the repositioning regime, reconsider the frequency and method of repositioning.	(Strength of Evidence = C)
30.3. Increase activity as rapidly as tolerated.	WRHA Expert Opinion (Strength of Evidence = C)

Recommendation	Level of Evidence
Repositioning Technique	
31. Repositioning contributes to the individual's comfort, dignity, and functional ability.	(Strength of Evidence = C)
31.1. Use devices to enable the individual to assist or independently position, lift and transfer (e.g. trapeze, bed rails)	WRHA Expert Opinion (Strength of Evidence = C)
31.2. Do not use soakers or bed sheets to reposition or move individuals in bed.	WRHA Expert Opinion (Strength of Evidence = C)
31.3. When the individual is positioned in the supine position the head of the bed should be flat (Diagram A) (WRHA Expert Opinion). If it is necessary to raise the head of bed, limit it to no greater than 30 degrees (Diagram B) to minimize the risk of sliding and shear forces. (Strength of Evidence = C)	WRHA Expert Opinion (Strength of Evidence = C)
31.4. Individuals positioned in the lateral side lying position should be positioned at 30 degrees of side lying. (Diagram C)	(Strength of Evidence = C)
31.4.1. To avoid pressure on the trochanter, a 90° side lying position should <u>not</u> be used.	(Strength of Evidence = C)
31.5. Sitting up in bed should be avoided. Individuals should be positioned in a wheelchair or other suitable chair for meals and activities.	WRHA Expert Opinion (Strength of Evidence = C)
REPOSITIONING THE SEATED INDIVIDUAL	
32. Position the individual to maximize his/her functional abilities while minimizing the effects of pressure and shear.	(Strength of Evidence = C)
32.1. Select a posture to ensure an individual's seated position will provide the stability necessary to maintain skeletal alignment while enabling participation in meaningful activities (Diagram D).	WRHA Expert Opinion (Strength of Evidence = C)
32.2. Select a posture that optimizes the pressure redistribution and reduces shear exerted on the skin and soft tissue.	(Strength of Evidence = C)
32.3. Limit the amount of time that an individual spends seated in the chair without some form of pressure redistribution.	(Strength of Evidence = C)
32.3.1. Individuals who are able to reposition themselves should be taught to reposition frequently, preferably every 15 minutes by using methods such as full or partial pushups, forward lean or side to side lean. Ideally this position should be held for 1-2 minutes.	WRHA Expert Opinion (Strength of Evidence = C)
32.3.2. Dynamic tilt, or tilt used in combination with other dynamic wheelchair functions (such as recline) may be indicated for individuals who are unable to independently maintain or change their position.	WRHA Expert Opinion (Strength of Evidence = C)
32.4. Refer an individual to OT and/or PT for a full seating assessment when challenges arise for the seated individual.	WRHA Expert Opinion (Strength of Evidence = C)
Repositioning Documentation	
33. Record repositioning regimes, specifying frequency and positions adopted, and include an evaluation of the outcome of the repositioning regime.	(Strength of Evidence = C)

Recommendation	Level of Evidence
Repositioning Education and Training	
34. Education about the role of repositioning in pressure ulcer prevention should be offered to all persons involved in the care of individuals at risk of pressure ulcer development, including the individual and significant others (where possible).	(Strength of Evidence = C)
34.1. Training in the correct methods of repositioning and use of equipment should be offered to all persons involved in the care of individuals at risk of pressure ulcer development, including the individual and significant others (where possible and appropriate).	(Strength of Evidence = C)
SLEEPING AND SITTING SUPPORT SURFACES	
General Recommendations	
35. Ensure sleep and sitting support surfaces are properly matched to the individual's needs for pressure redistribution, shear reduction, and microclimate control over a 24-hour period.	WRHA Expert Opinion (Strength of Evidence = C)
35.1. Select a support surface that meets the individual's needs. Do not base the selection of a support surface solely on the perceived level of risk for pressure ulcer development or the category/stage of any existing pressure ulcers.	(Strength of Evidence = C)
35.2. Ensure that the support surface is set up and used according to manufacturer's instructions.	WRHA Expert Opinion (Strength of Evidence = C)
35.2.1. Verify that the support surface is being used within its functional life span, as indicated by the specific manufacturer's recommended test method (or other industry-recognized test method) before use of the support surface.	(Strength of Evidence = C)
35.2.2. Ensure that the support surface is working and that the client is not bottoming out by palpating the support surface areas that correlate to weight bearing bony prominences.	(Strength of Evidence = C)
35.2.3. If there are concerns that the support surface is not functioning properly or the client is bottoming out contact OT and/or PT and/or site equipment representative, the manufacturer, or supplier to problem solve.	WRHA Expert Opinion (Strength of Evidence = C)
Mattress and Bed Use in Pressure Ulcer Prevention	
36. Use a mattress that minimizes peak pressures over bony prominences or provides intermittent removal of pressure.	WRHA Expert Opinion (Strength of Evidence = C)
36.1. Use higher-specification foam mattresses rather than standard hospital foam mattresses for all individuals assessed as being at risk for pressure ulcer development.	(Strength of Evidence = A)
36.2. There is no evidence of the superiority of one higher-specification foam mattress over alternative higher-specification foam mattresses.	(Strength of Evidence = A)
36.3. Use an active support surface (overlay or mattress replacement) (see glossary) for individuals at higher risk of pressure ulcer development where frequent manual repositioning is not possible.	(Strength of Evidence = B)
36.4. Alternating-pressure active support overlays and replacement mattresses have a similar efficacy in terms of pressure ulcer incidence.	(Strength of Evidence = A)
36.5. Do not use small-cell alternating-pressure air mattresses or overlays.	(Strength of Evidence = C)

Recommendation	Level of Evidence
36.6. Choose a support surface that is compatible with the care setting.	(Strength of Evidence = C)
36.7. Identify and prevent potential complications of support surface use.	(Strength of Evidence = C)
36.8. Choose positioning devices and incontinence pads that are compatible with the support surface.	(Strength of Evidence = C)
36.9. Limit the amount of linen and pads placed on the bed.	(Strength of Evidence = C)
Support Surfaces to Prevent Heel Pressure Ulcers	
37. Ensure that the heels do not contact the surface of the bed for individuals at high risk of developing heel pressure ulcers.	(Strength of Evidence = C)
37.1. Heels can be offloaded by placing a pillow under the calves so that heels are not touching the surface (i.e., “floating”).	(Strength of Evidence = B)
37.2. If pillows are not effective in offloading heels, heel-protection devices can be considered. They should elevate the heel completely (offload them) in such a way as to distribute the weight of the leg along the calf without putting pressure on the Achilles tendon. The knee should be in slight flexion.	(Strength of Evidence = C)
37.3. Apply the heel device according to manufacturer’s instructions.	(Strength of Evidence = C)
37.4. Ensure that the heel device is not too tight and does not create additional pressure. Check device placement more frequently in individuals with neuropathy, peripheral arterial disease, lower-extremity edema, or who are likely to develop edema.	(Strength of Evidence = C)
37.5. Remove heel devices and inspect the skin of the heels regularly.	(Strength of Evidence = C)
Wheelchair and Other Sitting Support Surfaces	
38. Use a pressure-redistributing seat cushion for individuals sitting in a chair whose mobility is reduced and who are thus at risk of pressure ulcer development.	(Strength of Evidence = B)
38.1. Consult OT and/or PT to recommend an appropriate wheelchair, including cushion and backrest.	WRHA Expert Opinion (Strength of Evidence = C)
38.1.1. Determine the effects of postural stability and asymmetries on pressure distribution by completing a comprehensive seating assessment.	WRHA Expert Opinion (Strength of Evidence = C)
38.1.2. Selection of cushions and cushion covers need to take into account the following factors: microclimate, amount of stretch, ease of transfers and repositioning and ease of cleaning	WRHA Expert Opinion (Strength of Evidence = C)
38.2. Assigned wheelchairs and seating components, including cushions, are not to be interchanged between individuals.	WRHA Expert Opinion (Strength of Evidence = C)
38.3. Inspect and maintain all aspects of the wheelchair and seating components at appropriate intervals to ensure proper functioning and that individual’s needs are met.	WRHA Expert Opinion (Strength of Evidence = C)
38.4. Consideration of a pressure-redistributing surface should also be given to other sitting surfaces. This includes, but is not limited to, toilet seats, bath seats, car seats, etc.	WRHA Expert Opinion (Strength of Evidence = C)
Use of other support surfaces in pressure ulcer prevention	
39. Natural sheepskin pads might assist in preventing pressure ulcers.	(Strength of Evidence = B)
40. Do not use synthetic sheepskin pads, cutout, ring, or donut-type devices or water-filled gloves.	(Strength of Evidence = C)

Recommendation	Level of Evidence
SPECIAL POPULATIONS	
Patients in the Operating Room	
41. Refine risk assessment of individuals undergoing surgery by examining other factors that are likely to occur and will increase risk of pressure ulcer development, including: a) Length of the operation and duration of time where repositioning cannot occur; b) Increased hypotensive episodes intraoperatively; c) Low core temperature during surgery; and d) Reduced mobility on day one postoperatively	(Strength of Evidence = C)
42. Use a pressure-redistributing mattress on the operating table for all individuals identified as being at risk of pressure ulcer development.	(Strength of Evidence = B)
43. Position the patient in such a way as to reduce the risk of pressure ulcer development during surgery.	(Strength of Evidence = C)
44. Elevate the heels completely (offload them) in such a way as to distribute the weight of the leg along the calf without putting all the pressure on the Achilles tendon. The knee should be in slight flexion.	(Strength of Evidence = C)
45. Pay attention to pressure redistribution prior to and after surgery.	(Strength of Evidence = C)
45.1. Place the individual on a pressure-redistributing mattress both prior to and after surgery.	(Strength of Evidence = C)
45.2. Position the individual in a different posture preoperatively, as well as postoperatively, than the posture adopted during surgery.	(Strength of Evidence = C)
Critically Ill Individuals	
46. Consider the need to change support surfaces for individuals with poor local and systemic oxygenation and perfusion to improve pressure redistribution, shear reduction, and microclimate control and utilize additional features (e.g., turn assistance, percussion) as needed.	(Strength of Evidence = C)
47. Consider the need to change support surfaces for individuals who cannot be turned for medical reasons such as spinal instability, hemodynamic instability and increased intracranial pressure. Resume routine repositioning as soon as these conditions stabilize.	(Strength of Evidence = C)
48. Consider slow, gradual turns allowing sufficient time for stabilization of hemodynamic and oxygenation status.	(Strength of Evidence = C)
49. Consider more frequent small shifts in position to allow some reperfusion in individuals who cannot tolerate frequent major shifts in body position. Small shifts do not replace support-surface changes when needed or turning (major shifts in body position) when possible.	(Strength of Evidence = C)
50. Prevent shear injury when lateral-rotation features are used. Assess skin frequently for shear injury. Secure the individual with bolster pads (provided by the manufacturer) to prevent sacral shearing when lateral-rotation features are selected for individuals without pressure ulcers. The individual should be aligned properly in the center of the surface.	(Strength of Evidence = C)
50.1. Continue to turn the individual and assess skin for pressure and shear damage. Discontinue lateral rotation at the first sign of tissue damage, and re-evaluate the individual and the support surface.	(Strength of Evidence = C)

Recommendation	Level of Evidence
BARIATRIC (OBESE) INDIVIDUALS	
Bed and Mattress Selection	
51. Fit the individual to the bed and mattress from the time of admission.	(Strength of Evidence = C)
51.1. Use beds and mattresses with appropriate weight capacity for the individual.	(Strength of Evidence = C)
51.2. Check for “bottoming out” of the mattress by palpating in the areas correlating to bony prominences.	(Strength of Evidence = C)
51.3. Ensure that the bed surface is sufficiently wide to allow repositioning on all turning surfaces.	(Strength of Evidence = C)
51.4. Confirm that the width of the bariatric individual does not reach the side rails of the bed when the individual is turned side-to-side.	(Strength of Evidence = C)
51.5. Consider using features that provide air flow over the surface of the skin to facilitate fluid evaporation if the skin is excessively moist or hot (e.g. low air loss bed).	(Strength of Evidence = C)
Equipment Selection	
52. Use a wheelchair and chair wide enough to accommodate the individual’s girth.	(Strength of Evidence = C)
53. Provide bariatric walkers, overhead trapezes on beds, and other devices to support continued mobility and independence.	(Strength of Evidence = C)
Assessment and Positioning	
54. Get adequate assistance to fully inspect all skin folds.	(Strength of Evidence = C)
55. Avoid pressure on skin from tubes and other medical devices.	(Strength of Evidence = C)
56. Use pillows or other positioning devices to offload pannus or other large skin folds and prevent skin-on-skin pressure and moisture trapping.	(Strength of Evidence = C)
57. Refer to OT and/or PT for assessment of transfers, equipment, repositioning, and seating and bed surface needs.	WRHA Expert Opinion (Strength of Evidence = C)

TREATMENT OF PRESSURE ULCERS	
Classification of Pressure Ulcers	
Recommendation	Level of Evidence
58. Use a validated pressure ulcer classification system to document the level of tissue loss.	(Strength of Evidence = C)
59. Do not use a pressure ulcer classification system to describe tissue loss in wounds other than pressure ulcers.	(Strength of Evidence = C)
60. Educate the professional about special assessment techniques to be used in darkly pigmented individuals.	(Strength of Evidence = B)
60.1. Intact Skin: Category/Stage I pressure ulcers and suspected deep-tissue injury may be difficult to detect with visual inspection alone in darkly pigmented individuals. Assess differences in skin temperature, skin color, tissue consistency (i.e., boggy or firm) and pain between affected areas and normal tissue when skin is intact.	(Strength of Evidence = B)
60.2. Open Pressure Ulcers: Inflammatory redness from cellulitis and deeper tissue damage may be difficult to detect in darkly pigmented individuals. Assess the skin for heat, tenderness, pain or change in tissue consistency to identify the extent of inflammation and possible cellulitis and/or undermining in pressure ulcers presenting as open pressure ulcers (i.e. Category/Stage II, III, IV and unstageable ulcers).	(Strength of Evidence = C)
61. Educate the professional on differentiating pressure ulcers from other types of wounds (e.g., venous ulcers, arterial ulcers, neuropathic ulcers, incontinence-associated dermatitis, skin tears, and intertrigo).	(Strength of Evidence = C)
62. Educate the professional about the appropriate use of the classification system and the appearance of different tissue types at common pressure ulcer sites.	(Strength of Evidence = B)
63. Confirm the reliability of classifications among the professionals responsible for classifying pressure ulcers.	(Strength of Evidence = B)
64. Do not classify pressure ulcers on mucous membranes.	(Strength of Evidence = C)
ASSESSMENT AND MONITORING OF HEALING	
Assessment of the Individual with a Pressure Ulcer	
65. Complete a comprehensive initial assessment of the individual with a pressure ulcer.	(Strength of Evidence = C)
66. Reassess the individual if the ulcer does not show signs of healing as expected despite adequate local wound care, pressure offloading, and nutrition.	(Strength of Evidence = C)
66.1. Expect some signs of healing in most individuals within 2 weeks.	(Strength of Evidence = B)
66.2. Adjust expectations in the presence of multiple factors (particularly unmodifiable factors) that impair wound healing (e.g., persistent undernutrition, poor perfusion, and co-morbidities known to impair wound healing).	(Strength of Evidence = B)
66.3. Teach the individual and their family about the normal healing process and keep them informed about progress (or lack of progress) toward healing, including signs and symptoms that should be brought to the professional's attention.	(Strength of Evidence = C)
Pressure Ulcer Assessment	
67. Assess the pressure ulcer initially and re-assess it at least weekly, documenting findings.	(Strength of Evidence = C)

Risk Assessment	Level of Evidence
68. With each dressing change, observe the pressure ulcer for developments that may indicate the need for a change in treatment (e.g., wound improvement, wound deterioration, more or less exudate, signs of infection, or other complications).	(Strength of Evidence = C)
69. Assess and accurately document physical characteristics such as location, category/stage, size, tissue type(s), wound bed and periwound condition, wound edges, sinus tracts, undermining, tunneling, exudate, necrotic tissue, odor, presence/absence of granulation tissue, and epithelialization.	(Strength of Evidence = C)
70. Position the individual in a consistent neutral position for wound measurement.	(Strength of Evidence = C)
70.1. Length and width: Select a uniform, consistent method for measuring wound length and width to facilitate meaningful comparisons of wound measurements across time.	(Strength of Evidence = B)
70.2. Wound depth, tunneling, and undermining: Select a consistent, uniform method for measuring depth. Care should be taken to avoid causing injury when probing the depth of a wound bed or determining the extent of undermining or tunneling.	(Strength of Evidence = C)
71. Use pressure ulcer assessment findings to plan interventions that will best promote healing.	(Strength of Evidence = C)
Methods for Monitoring Healing	
72. Regularly assess progress towards healing.	(Strength of Evidence = C)
72.1. Use a validated tool such as the Pressure Ulcer Scale for Healing (PUSH©) Tool or the Bates-Jensen Wound Assessment Tool (BWAT) (Appendix A), formerly known as the Pressure Sore Status Tool (PSST).	(Strength of Evidence = B)
72.2. Use clinical judgment to assess signs of healing such as decreasing amount of exudate, decreasing wound size, and improvement in wound bed tissue.	(Strength of Evidence = C)
72.3. Consider using baseline and serial photographs to monitor pressure ulcer healing over time. Use standard photographic techniques with appropriate consent.	(Strength of Evidence = C)
72.4. Consider the use of reliable and valid electronically assisted data-collection devices.	(Strength of Evidence = C)
73. Re-evaluate the pressure ulcer, the plan of care, and the individual if the pressure ulcer does not show progress toward healing within 2 weeks (or as expected given the individual's overall condition and ability to heal).	(Strength of Evidence = C)
73.1. Signs of deterioration should be addressed immediately.	(Strength of Evidence = C)
Nutrition in Pressure Ulcer Healing	
74. Screen and assess nutritional status for each individual with a pressure ulcer at admission and with each condition change — and/or when progress toward pressure ulcer closure is not observed.	(Strength of Evidence = C)
74.1. Refer all individuals with a pressure ulcer to a dietitian for early assessment of and intervention for nutritional problems.	(Strength of Evidence = C)
74.2. Assess weight status for each individual to determine weight history and significant weight loss from usual body weight (> 5% change in 30 days or > 10% in 180 days).	(Strength of Evidence = C)
74.3. Assess the individual's ability to eat independently.	(Strength of Evidence = C)
74.4. Assess the adequacy of total nutrient intake (food, fluid, oral supplements, enteral/parenteral feedings).	(Strength of Evidence = C)
74.5. Assess nutritional indicators including anemia, hemoglobin and serum albumin and pre-albumin levels, measures of nutritional intake, and weight.	WRHA Expert Opinion (Strength of Evidence = C)

Recommendation	Level of Evidence
75. Provide sufficient calories.	(Strength of Evidence = B)
75.1. Provide 30-35 kcalories/kg body weight for individuals under stress with a pressure ulcer. Adjust formula based on weight loss, weight gain, or level of obesity. Individuals who are underweight or who have had significant unintentional weight loss may need additional kcalories to cease weight loss and/or regain lost weight.	(Strength of Evidence = C)
75.1.1 Due to variation in energy requirements in individuals with pressure ulcers, energy expenditure should be evaluated by indirect calorimetry when available.	WRHA Expert Opinion (Strength of Evidence = C)
75.1.2. Due to variations in energy expenditure, it is recommended that energy requirements be individually assessed in spinal cord injury patients with pressure ulcers, using indirect calorimetry if possible. Regular weight monitoring is recommended as a valid and non-invasive method to determine whether a patient is anabolic, catabolic or in a stable metabolic state.	WRHA Expert Opinion (Strength of Evidence = C)
75.2. Revise and modify (liberalize) dietary restrictions when limitations result in decreased food and fluid intake. These adjustments are to be managed by a dietitian or medical professional.	(Strength of Evidence = C)
75.3. Provide enhanced foods and/or oral supplements between meals if needed.	(Strength of Evidence = B)
75.4. Consider nutritional support (enteral or parenteral nutrition) when oral intake is inadequate. This must be consistent with the individual's goals.	(Strength of Evidence = C)
76. Provide adequate protein for positive nitrogen balance for an individual with a pressure ulcer.	(Strength of Evidence = B)
76.1. Offer 1.25 to 1.5 grams protein/kg body weight daily for an individual with a pressure ulcer when compatible with goals of care, and reassess as condition changes.	(Strength of Evidence = C)
76.2. Assess renal function to ensure that high levels of protein are appropriate for the individual.	(Strength of Evidence = C)
77. Provide and encourage adequate daily fluid intake for hydration.	(Strength of Evidence = C)
77.1. A minimum of 1 ml/kcal/day (30-35ml/kg/day) is a general guideline to meet fluid requirements for patients with pressure ulcers.	WRHA Expert Opinion (Strength of Evidence = C)
77.2. Monitor individuals for signs and symptoms of dehydration: changes in weight, skin turgor, urine output, elevated serum sodium, or calculated serum osmolality.	(Strength of Evidence = C)
77.3. Provide additional fluid for individuals with dehydration, elevated temperature, vomiting, profuse sweating, diarrhea, or heavily draining wounds.	(Strength of Evidence = C)
78. Provide adequate vitamins and minerals.	(Strength of Evidence = B)
78.1. Encourage consumption of a balanced diet that includes good sources of vitamins and minerals.	(Strength of Evidence = B)
78.2. Offer vitamin and mineral supplements when dietary intake is poor or deficiencies are confirmed or suspected.	(Strength of Evidence = B)
79. Maintain glycemic control.	WRHA Expert Opinion (Strength of Evidence = C)
79.1 Assess glycemic control by measuring fasting blood glucose and glycosylated hemoglobin.	WRHA Expert Opinion (Strength of Evidence = C)

Recommendation	Level of Evidence
Pain Assessment	
80. Assess all individuals for pain related to a pressure ulcer or its treatment.	(Strength of Evidence = B)
81. Assess for pressure-ulcer-related pain in adults using a validated scale.	(Strength of Evidence = B)
82. Assess for pain in neonates and children using a validated scale.	(Strength of Evidence = C)
82.1. Use the CRIES (Crying; Requires O ₂ for Saturation >95%; Increasing vital signs; Expression; Sleepless) Scale for neonates up to 6 months.	(Strength of Evidence = C)
82.2 Use the FLACC (Face, Leg, Activity, Cry, and Consolability) tool for children 2 months to 7 years of age.	(Strength of Evidence = C)
83. Pain assessment should include an assessment of body language and nonverbal cues (e.g., change in activity, loss of appetite, guarding, grimacing, and moaning).	(Strength of Evidence = C)
Pain Prevention	
84. Use a mechanical lift or friction reducing slider to minimize friction and/or shear when repositioning an individual, keeping bed linens smooth and unwrinkled.	(Strength of Evidence = C)
85. Position the individual off of the pressure ulcer whenever possible (see Support Surface and Repositioning section).	(Strength of Evidence = C)
86. Avoid postures that increase pressure, such as sitting positions greater than 30° or a 90° side-lying position.	(Strength of Evidence = C)
87. Minimize pressure ulcer pain by handling all wounds gently; flushing and not rubbing unnecessarily during cleansing; and protecting the periwound skin.	(Strength of Evidence = C)
Pain Management	
88. Organize care delivery to ensure that it is coordinated with pain medication administration and that minimal interruptions follow. Set priorities for treatment.	(Strength of Evidence = C)
89. Encourage individuals to request a “time out” during any procedure that causes pain.	(Strength of Evidence = C)
90. Reduce pressure ulcer pain by keeping the wound bed covered and moist, and using a non-adherent dressing. (Note: Stable dry eschar is usually not moistened.)	(Strength of Evidence = B)
91. Use dressings less likely to cause pain and/or those likely to require less frequent dressing changes (e.g., hydrocolloids, hydrogels, alginates, polymeric membrane foams, foam, soft silicone dressings, and ibuprofen-impregnated dressings). Note: Gauze dressings are more likely to cause pain. See Dressings section for further information.	(Strength of Evidence = C)
92. For an individual with pain from a pressure ulcer, music, meditation, distraction, conversations, and guided imagery are sometimes beneficial.	(Strength of Evidence = C)
93. Administer pain medication regularly, in the appropriate dose following the World Health Organization Dosing Ladder.	(Strength of Evidence = C)
94. Anticipate incident pain and combine pharmacological and non-pharmacological options for prevention.	WRHA Expert Opinion (Strength of Evidence = C)
95. Encourage repositioning as a means to reduce pain, if consistent with the individual’s wishes.	(Strength of Evidence = C)

Recommendation	Level of Evidence
Debridement Pain	
96. Use adequate pain-control measures, including additional dosing at times of wound manipulation, wound cleansing, dressing change, debridement, etc.	(Strength of Evidence = C)
97. In refractory cases, consider topical opioids to reduce or eliminate pressure ulcer pain. Topical morphine (mixed with hydrogel) may be effective.	WRHA Expert Opinion (Strength of Evidence = C)
98. Apply topical medications according to manufacturer's directions to allow adequate time for action prior to wound treatments.	(Strength of Evidence = C)
Chronic Pain Management	
99. Manage persistent pressure ulcer pain of neuropathic origin with a local anesthetic or adjuvant agents (tricyclic antidepressant or epileptic (i.e. gabapentin) as well as transcutaneous nerve stimulation or warm applications.	WRHA Expert Opinion (Strength of Evidence = C)
100. Refer the individual with chronic pain related to pressure ulceration to the appropriate pain and/or wound clinic resources.	(Strength of Evidence = C)
Educate Individuals, Family and Health Care Providers	
101. Educate the individuals, caregivers, and health care providers about causes, assessment and management of pressure ulcer pain.	(Strength of Evidence = C)
REPOSITIONING FOR THE TREATMENT OF PRESSURE ULCERS	
General Repositioning	
102. Repositioning is required with all individuals who have developed a pressure ulcer.	
102.1. Do not position an individual directly on a pressure ulcer.	(Strength of Evidence = C)
102.2. An assessment is required to determine which positions will effectively off-load a pressure ulcer.	WRHA Expert Opinion (Strength of Evidence = C)
102.3. Consider potential complications if total bedrest is prescribed to create a pressure-free wound environment.	WRHA Expert Opinion (Strength of Evidence = C)
102.4. Continue to reposition the individual regardless of the support surface in use. Establish repositioning frequency based on the characteristics of the support surface and the individual's tissue response after an interval of time in a specific position.	(Strength of Evidence = C)
102.5. Use transfer aids to reduce friction and shear. Use a friction reducing slider or mechanical lifting device. Do not leave moving and handling equipment under the individual after use, i.e mechanical lift slings.	(Strength of Evidence = C)
102.6. Consider consulting OT and/or PT for individuals who have limited mobility, spasticity or abnormal muscle tone and do not have the ability to independently reposition themselves in bed or in a chair. An increase in activity should be facilitated as tolerated.	WRHA Expert Opinion (Strength of Evidence = C)
BED REPOSITIONING	
Repositioning Frequency	
103. Frequency of repositioning will be influenced by variables concerning the individual (Strength of Evidence = C) and the support surface in use. (Strength of Evidence = A)	(Strength of Evidence = C) (Strength of Evidence = A)

Recommendation	Level of Evidence
103.1. Repositioning frequency will be determined by the individual's tissue tolerance, their level of activity and mobility, their general medical condition, the overall treatment objectives, assessments of the individual's skin condition and the type of support surface in use. Individuals should be turned every two hours until a personalized schedule is established.	(Strength of Evidence = C)
103.2. Inspect the skin for additional damage each time the individual is repositioned.	(Strength of Evidence = C)
103.3. Do not turn the individual onto a body surface that is damaged or still reddened from a previous episode of pressure loading, especially if the area of redness does not blanch (i.e., Category/Stage I pressure ulcer).	(Strength of Evidence = C)
Repositioning Technique	
104. Repositioning contributes to the individual's comfort, dignity, and functional ability.	(Strength of Evidence = C)
104.1. Use devices to enable the individual to assist or independently position, lift and transfer (example trapeze, bed rails).	WRHA Expert Opinion (Strength of Evidence = C)
104.2. Do not use soakers or bed sheets to reposition or move individuals in bed. Use friction reducing devices (e.g., slider sheets or tubes).	WRHA Expert Opinion (Strength of Evidence = C)
104.3. When the individual is positioned in the supine position the head of the bed should be flat (Diagram A). If it is necessary to raise the head of bed, limit it to no greater than 30 degrees (Diagram B) to minimize the risk of sliding and shear forces.	WRHA Expert Opinion (Strength of Evidence = C)
104.4. Individuals positioned in the lateral side lying position should be positioned at no greater than 30 degrees. (Diagram C)	(Strength of Evidence = C)
104.5. To avoid pressure on the trochanter, a 90 degree side lying position should not be used.	(Strength of Evidence = C)
104.6. Sitting in bed should be avoided. Individuals should be positioned in a wheelchair or other suitable chair for meals and activities.	WRHA Expert Opinion (Strength of Evidence = C)
104.7. Do not use artificial sheepskin or ring- or donut-shaped devices for an individual with a pressure ulcer.	(Strength of Evidence = C)
104.8. Do not apply heating devices (e.g., hot water bottles, heating pads, built-in bed warmers) directly on pressure ulcers.	(Strength of Evidence = C)
REPOSITIONING THE SEATED INDIVIDUAL	
105. Only sit someone with a pressure ulcer if the pressure to the area can be offloaded or minimized in a seated position. Consult OT and/or PT to ensure that the proper equipment is in place and to make recommendations for the most effective position for offloading pressure to the ulcer.	WRHA Expert Opinion (Strength of Evidence = C)
105.1 Ensure that the feet are properly supported either directly on the floor, on a foot stool or on foot rests when sitting in a bedside chair or wheelchair (Diagram D).	(Strength of Evidence = C)
105.2 Limit the amount of time that an individual spends seated in the chair without some form of pressure redistribution.	(Strength of Evidence = C)
105.3 Individuals who are able to reposition themselves should be taught to reposition frequently, preferably every 15 minutes by using methods such as full or partial pushups, forward lean or side to side lean. Ideally this position should be held for 1-2 minutes.	WRHA Expert Opinion (Strength of Evidence = C)

Recommendation	Level of Evidence
105.4 Dynamic tilt, or tilt used in combination with other dynamic wheelchair functions (such as recline) may be indicated for individuals who are unable to independently maintain or change their position.	WRHA Expert Opinion (Strength of Evidence = C)
105.5 Individuals with pressure ulcers on the sacrum/coccyx or ischia, where pressure cannot be offloaded or minimized, should limit sitting. Sitting time should be determined based on an assessment of tissue tolerance.	(Strength of Evidence = C)
105.6 Refer to OT and/or PT to reassess seating and positioning if the individual's ulcer worsens or fails to improve.	WRHA Expert Opinion (Strength of Evidence = C)
SUPPORT SURFACES FOR TREATMENT OF PRESSURE ULCERS	
Sleep and Sitting Support Surfaces	
General Recommendations	
106. Ensure sleep and seating support surfaces are properly matched to the individual's needs for pressure redistribution, shear reduction, and microclimate control over a 24-hour period.	WRHA Expert Opinion (Strength of Evidence = C)
106.1. Select a support surface that meets the individual's needs. Do not base the selection of a support surface solely on the perceived level of risk for pressure ulcer development or the category/stage of any existing pressure ulcers.	(Strength of Evidence = C)
106.2. Ensure that the support surface is set up and used according to manufacturer's instructions.	WRHA Expert Opinion (Strength of Evidence = C)
106.2.1. Verify that the support surface is being used within its functional life span, as indicated by the specific manufacturer's recommended test method (or other industry-recognized test method) before use of the support surface.	(Strength of Evidence = C)
106.2.2. On every encounter, ensure that the support surface is working and that the client is not bottoming out by palpating areas correlating to the coccyx and sacral bony prominences.	(Strength of Evidence = C)
106.2.3. If there are concerns that the support surface is not functioning properly or the client is bottoming out contact site equipment representative, supplier or the manufacturer to problem solve.	WRHA Expert Opinion (Strength of Evidence = C)
Mattress and Bed Use	
107. Use a mattress that minimizes peak pressures over bony prominences or intermittent removal of pressure.	WRHA Expert Opinion (Strength of Evidence = C)
107.1 A higher-specification foam or similar non-powered pressure redistribution mattress is the minimum standard for individuals with pressure ulcers.	(Strength of Evidence = C)
107.2 Replace the existing mattress with an active support surface (see glossary) that provides improved pressure redistribution and shear reduction for the individual if she or he: • Cannot be positioned off of the ulcer or • Has pressure ulcers on two or more turning surfaces (e.g., the sacrum and trochanter), thus limiting turning options or • Fails to heal or demonstrates ulcer deterioration despite appropriate comprehensive care or • Is at high risk for additional ulcers or • "Bottoms out" on the existing support surface	(Strength of Evidence = C)

Recommendation	Level of Evidence
107.3. Consider the use of low-air-loss or air fluidized beds when the individual has any of the features in 107.2 and: ☐ is not showing signs of healing after 2 weeks or ☐ has excessive skin moisture and/or elevated skin temperature in addition to other pressure ulcer risk factors	WRHA Expert Opinion (Strength of Evidence = C)
107.4 Do not use small-cell alternating-pressure air mattresses or overlays.	(Strength of Evidence = C)
107.5 Choose a support surface that is compatible with the care setting.	(Strength of Evidence = C)
107.6 Identify and prevent potential complications of support surface use.	(Strength of Evidence = C)
107.7. Choose positioning devices and incontinence pads that are compatible with the support surface.	(Strength of Evidence = C)
107.8. Limit the amount of linen and pads placed on the bed.	(Strength of Evidence = C)
Wheelchair and Other Sitting Support Surfaces	
108. Seating components (backrest and cushion) must minimize or offload pressure to the pressure ulcer area.	(Strength of Evidence = C)
108.1. Consult OT and/or PT to assess the individual and recommend an appropriate wheelchair and seating components (cushion and backrest).	WRHA Expert Opinion (Strength of Evidence = C)
108.1.1. Determine the effects of postural stability and asymmetries on pressure distribution by completing a comprehensive seating assessment.	WRHA Expert Opinion (Strength of Evidence = C)
108.2. Determine the exact location of the pressure ulcer before making a cushion or backrest recommendation.	WRHA Expert Opinion (Strength of Evidence = C)
108.3. Seat individuals with ischial ulcers on a seating support surface that provides contour, uniform pressure distribution, and high immersion or offloading.	(Strength of Evidence = C)
108.4 Selection of cushions and cushion covers need to take into account the following factors: microclimate, amount of stretch, ease of transfers and repositioning, and ease of cleaning.	WRHA Expert Opinion (Strength of Evidence = C)
108.5. Inspect and maintain all aspects of the wheelchair seating components at appropriate regular intervals to ensure proper functioning and that the individual's needs are met.	WRHA Expert Opinion (Strength of Evidence = C)
108.6 Assigned wheelchairs and seating components, including cushions, are not to be interchanged between individuals.	WRHA Expert Opinion (Strength of Evidence = C)
108.7 Request OT and/or PT to re-evaluate the seating components if the ulcers are not improving.	WRHA Expert Opinion (Strength of Evidence = C)
108.8 Consideration of a pressure-redistributing surface should also be given to other seated surfaces. This includes, but is not limited to, toilet seats, bath seats, car seats, etc.	WRHA Expert Opinion (Strength of Evidence = C)
108.9 Provide complete and accurate training to individuals and their caregivers, on the use and maintenance of wheelchair and seating component devices that have been fitted for the individual.	WRHA Expert Opinion (Strength of Evidence = C)
Support Surfaces to treat Heel Ulcers	
109. Ensure that the heels are free of the surface of the bed for individuals at high risk of developing heel pressure ulcers.	(Strength of Evidence = C)

Recommendation	Level of Evidence
109.1. Completely offload the heels by placing a pillow under the calves to “float the heels” off of the bed.	(Strength of Evidence = B)
109.2. If pillows are not effective in offloading heels, heel-protection devices can be considered. They should elevate the heel completely (offload them) in such a way as to distribute the weight of the leg along the calf without putting pressure on the Achilles tendon. The knee should be in slight flexion.	(Strength of Evidence = C)
109.3. Apply the heel device according to manufacturer’s instructions.	(Strength of Evidence = C)
109.4. Ensure that the heel device is not too tight and does not create additional pressure. Check device placement more frequently in individuals with neuropathy, peripheral arterial disease, lower-extremity edema; or who are likely to develop edema.	(Strength of Evidence = C)
109.5. Remove the heel device regularly to inspect the skin.	(Strength of Evidence = C)
SPECIAL POPULATIONS	
Critically Ill Individuals	
110. Consider the need to change support surfaces for individuals with poor local and systemic oxygenation and perfusion to improve pressure redistribution, shear reduction, and microclimate control and utilize additional features (e.g., turn assistance, percussion) as needed.	(Strength of Evidence = C)
111. Consider the need to change support surfaces for individuals who cannot be turned for medical reasons such as spinal instability and hemodynamic instability. Resume routine repositioning as soon as these conditions stabilize.	(Strength of Evidence = C)
112. Consider slow, gradual turns allowing sufficient time for stabilization of hemodynamic and oxygenation status.	(Strength of Evidence = C)
113. Consider more frequent small shifts in position to allow some reperfusion in individuals who cannot tolerate frequent major shifts in body position. Small shifts do not replace support-surface changes when needed or turning (major shifts in body position) when possible.	(Strength of Evidence = C)
114. Prevent shear injury when lateral-rotation features are used. Assess skin frequently for shear injury.	(Strength of Evidence = C)
114.1. Consider alternative methods, other than lateral rotation, of pressure redistribution in individuals with sacral or buttock pressure ulcers.	(Strength of Evidence = C)
114.2. Offload the pressure ulcer(s) in individuals undergoing lateral-rotation therapy.	(Strength of Evidence = C)
114.3. Inspect the pressure ulcer and the peri-ulcer skin for shear injury with every dressing change. Shear injury may appear as deterioration of the ulcer edge, undermining, and/or as increasing inflammation of peri-ulcer skin or the ulcer.	(Strength of Evidence = C)
INDIVIDUALS WITH NEUROLOGICAL CONDITIONS	
In addition to the following recommendation, all general treatment recommendations should be followed.	
115. Consult a therapist who has expertise in treating individuals with neurological conditions for a comprehensive seating assessment and evaluation of all positioning and support surfaces required over a 24-hour period.	WRHA Expert Opinion (Strength of Evidence = C)

Recommendation	Level of Evidence
BIOPHYSICAL AGENTS IN PRESSURE ULCER MANAGEMENT	
(See “Care of the Wound Bed” for other recommendations for wound care. The treatments discussed in this section have been studied specifically in individuals with pressure ulcers)	
ELECTRICAL STIMULATION	
116. Consider the use of direct current (capacitive) electrical stimulation (ES) in the management of recalcitrant Category/Stage II, as well as Category/Stage III and IV pressure ulcers to facilitate wound healing.	(Strength of Evidence = A)
ELECTROMAGNETIC AGENTS	
117. Consider the use of pulsed electromagnetic field (PEMF) treatment for recalcitrant Category/Stage II, III, and IV pressure ulcers.	(Strength of Evidence = C)
PHOTOTHERAPY (LASER, INFRARED, ULTRAVIOLET)	
Ultraviolet Light Therapy	
118. Consider a short-term application of ultraviolet light C (UVC) if traditional therapies fail.	(Strength of Evidence = C)
119. Consider a course of ultraviolet light as an adjunctive therapy to reduce bacterial burden in clean, but critically colonized Category/Stage II and IV pressure ulcers.	(Strength of Evidence = C)
Acoustic Energy (Ultrasound)	
120. Consider use of non-contact low-frequency (40 kHz) ultrasound spray (NC-LFUS) for treatment of clean recalcitrant Category/Stage III and IV pressure ulcers.	(Strength of Evidence = C)
121. Consider use of low-frequency (22.5, 25, 35 kHz) ultrasound for debridement of necrotic soft tissue (not eschar).	(Strength of Evidence = C)
122. Consider use of high-frequency (MHz) ultrasound as an adjunct for the treatment of infected pressure ulcers.	(Strength of Evidence = C)
Negative Pressure Wound Therapy	
123. Consider NPWT as an early adjuvant for the treatment of deep, Category/Stage III and IV pressure ulcers.	(Strength of Evidence = B)
124. Debride the pressure ulcer of necrotic tissue prior to the use of NPWT.	(Strength of Evidence = C)
125. Follow safe regimen in applying and removing the NPWT system.	(Strength of Evidence = C)
126. Evaluate the pressure ulcer with each dressing change.	(Strength of Evidence = C)
127. If pain is anticipated or reported, consider placing a non-adherent interface dressing on the wound bed, lowering the level of pressure, and/or changing the type of pressure (continuous or intermittent).	(Strength of Evidence = C)
128. Educate the individual and his/her family about NPWT when used in the home settings.	(Strength of Evidence = C)
HYDROTHERAPY	
Whirlpool	
129. Consider a course of whirlpool as an adjunct for wound cleansing and facilitating healing.	(Strength of Evidence = C)
130. Consider a course of whirlpool for reducing wound bioburden and infection.	(Strength of Evidence = C)
Pulsatile Lavage with Suction	
131. Consider a course of pulsatile lavage with suction for wound cleansing and debridement).	(Strength of Evidence = C)

Recommendation	Level of Evidence
Growth Factors for Pressure Ulcer Treatment	
132. The combined clinical evidence on platelet-derived growth factor (PDGF) suggests the PDGF-BB may improve healing of pressure ulcers. However, the evidence is not sufficient to recommend this treatment for routine use.	(Strength of Evidence = B)
SURGERY FOR PRESSURE ULCERS	
Preoperative Recommendations	
133. Evaluate the need for surgical consultation for operative repair for individuals with Category/Stage III or IV pressure ulcers that are not closing with conservative treatment, where all causative factors have been addressed as best as possible and/or for individuals who desire more rapid closure of the ulcer.	(Strength of Evidence = C)
134. Obtain a surgical consultation for possible urgent drainage and/or debridement if the pressure ulcer has large amounts of necrotic tissue, advancing cellulitis or is a suspected source of sepsis.	(Strength of Evidence = C)
135. Prior to surgery, optimize physical factors that may impair surgical wound healing.	(Strength of Evidence = C)
136. Prior to surgery, optimize psychosocial factors that often impair surgical wound healing.	(Strength of Evidence = B)
137. Assess for osteomyelitis; if present, infected bone must be resected prior to or during surgical closure.	(Strength of Evidence = B)
138. Arrange for a support surface that provides intensive pressure redistribution and microclimate control and assess the individual's tolerance of the support surface one to two days before surgery.	WRHA Expert Opinion (Strength of Evidence = C)
Intraoperative Recommendations	
139. Position the individual on the operating table with careful attention to protecting pressure points and the airway.	(Strength of Evidence = C)
140. Excise the ulcer (including abnormal skin, necrotic tissue, sinus tracts, bursa and any infected bone) to the largest extent possible at the time of surgical closure.	(Strength of Evidence = C)
141. Design flaps with composite tissues to improve durability. When possible, choose a flap that will not violate adjacent flap territories so as to preserve all future options for flap coverage.	(Strength of Evidence = C)
142. Use a flap that is as large as possible, placing the suture line away from any areas of direct pressure. Minimize tension on the incisions at the time of closure. Consider possible functional loss and rehabilitation needs, especially in ambulatory individuals.	(Strength of Evidence = C)
143. Transfer the individual with adequate help from the operating table onto the bed to avoid flap disruption.	(Strength of Evidence = C)
Postoperative Recommendations	
144. Maintain the individual on an intensive pressure-redistribution system that reduces shear and pressure on the operative site, limits tension on the incision(s), and controls local microclimate. Do not elevate the head of the bed or move the person from the bed without explicit approval from the surgeon.	(Strength of Evidence = C)
145. Protect the blood supply to the flap from pressure and pulling.	(Strength of Evidence = C)
146. Report signs of flap failure to the surgeon immediately.	(Strength of Evidence = C)

Recommendation	Level of Evidence
147. Monitor drainage from wound drains making certain that drainage tubes are not kinked or clogged.	(Strength of Evidence = C)
148. Prevent hazards of immobility.	(Strength of Evidence = C)
149. Turn the individual regularly with a turning sheet to prevent new pressure ulcers, regardless of the support surface in use.	(Strength of Evidence = C)
150. Initiate a program of progressive sitting according to the surgeon's orders.	(Strength of Evidence = C)
151. Position the individual only in an appropriate pressure-redistributing seating system (chair and cushion) when he/she is sitting.	(Strength of Evidence = C)
152. Dress the individual in appropriate clothing to prevent injury to the flap when using slide boards.	(Strength of Evidence = C)
153. Confirm the presence of an adequate social network at home prior to discharging the individual from a facility.	(Strength of Evidence = B)
154. Confirm the individual's ability to obtain needed equipment, maintain the equipment, and adhere to postoperative needs after surgery.	(Strength of Evidence = C)

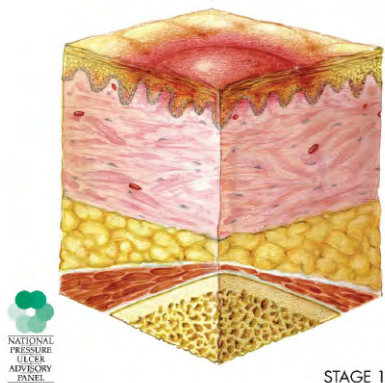
COMMON PRESSURE ULCER DEFINITION

A pressure ulcer is localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear. A number of contributing or confounding factors are also associated with pressure ulcers; the significance of these factors is yet to be elucidated. NPUAP has identified six different categories of injury.

INTERNATIONAL NPUAP-EPUAP PRESSURE ULCER CLASSIFICATION SYSTEM

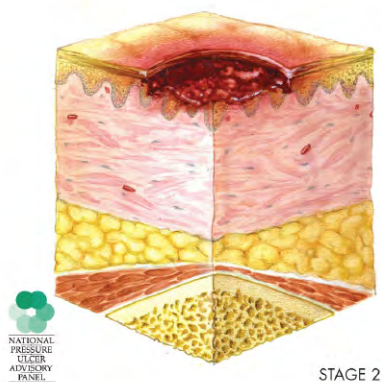
Category/Stage I: Non-blanchable erythema

Intact skin with non-blanchable redness of a localized area usually over a bony prominence. Darkly pigmented skin may not have visible blanching; its color may differ from the surrounding area. The area may be painful, firm, soft, warmer or cooler as compared to adjacent tissue. Category I may be difficult to detect in individuals with dark skin tones.



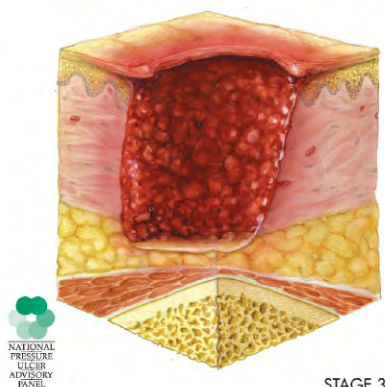
Category/Stage II: Partial thickness

Partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled or sero-sanguinous filled blister. Presents as a shiny or dry shallow ulcer without slough or bruising*. This category should not be used to describe skin tears, tape burns, incontinence associated dermatitis, maceration or excoriation. *Bruising indicates deep tissue injury.



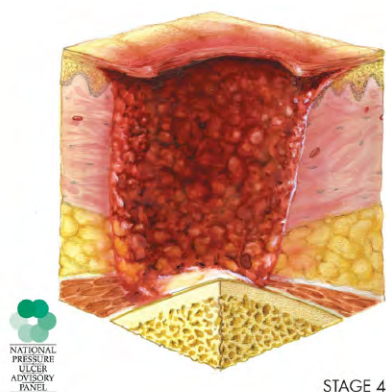
Category/Stage III: Full thickness skin loss

Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle are not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunneling. The depth of a Category/Stage III pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have (adipose) subcutaneous tissue and Category/Stage III ulcers can be shallow. In contrast, areas of significant adiposity can develop extremely deep Category/Stage III pressure ulcers. Bone/tendon is not visible or directly palpable.



Category/Stage IV: Full thickness tissue loss

Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present. Often includes undermining and tunneling. The depth of a Category/Stage IV pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have (adipose) subcutaneous tissue and these ulcers can be shallow. Category/Stage IV ulcers can extend into muscle and/or supporting structures (e.g., fascia, tendon or joint capsule) making osteomyelitis or osteitis likely to occur. Exposed bone/muscle is visible or directly palpable.



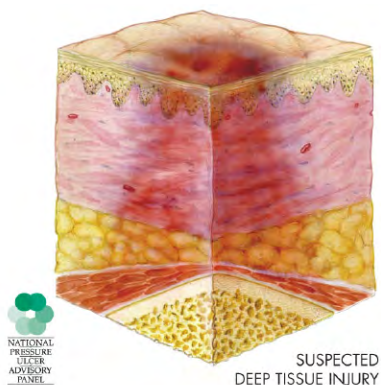
Unstageable/ Unclassified: Full thickness skin or tissue loss – depth unknown

Full thickness tissue loss in which actual depth of the ulcer is completely obscured by slough (yellow, tan, gray, green or brown) and/or eschar (tan, brown or black) in the wound bed. Until enough slough and/or eschar are removed to expose the base of the wound, the true depth cannot be determined; but it will be either a Category/Stage III or IV. Stable (dry, adherent, intact without erythema or fluctuance) eschar on the heels serves as “the body’s natural (biological) cover” and should not be removed.



Suspected Deep Tissue Injury – depth unknown

Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue. Deep tissue injury may be difficult to detect in individuals with dark skin tones. Evolution may include a thin blister over a dark wound bed. The wound may further evolve and become covered by thin eschar. Evolution may be rapid exposing additional layers of tissue even with optimal treatment.



PRESSURE ULCER PREVENTION RECOMMENDATIONS

RISK ASSESSMENT

Epidemiological research has increased considerably in recent years, allowing for a better understanding of risk factors important in the development of pressure ulcers. This literature should underpin risk assessment practice. However, one must be careful in interpreting the results of these epidemiological research studies, as the results may depend on which risk factors are included in a multivariable model.

1. Establish a risk assessment policy in all health care settings. (Strength of Evidence = C)

Each health care setting should have a policy in place that includes clear recommendations for: a structured approach to risk assessment relevant to that health care setting; clinical areas to be targeted; the timing of risk assessment and reassessment; documentation of risk assessment; and communication of that information to the wider health care team.

2. Educate health care professionals on how to achieve an accurate and reliable risk assessment. (Strength of Evidence = B)

3. Document all risk assessments. (Strength of Evidence = C)

Documentation of risk assessments ensures communication within the multidisciplinary team, provides evidence that care planning is appropriate, and serves as a benchmark for monitoring the individual's progress.

4. Use a structured approach to risk assessment to identify individuals at risk of developing pressure ulcers. (Strength of Evidence = C)

The WRHA recommends the use of the Braden Scale or the Pressure Ulcer Risk Scale (embedded in the Minimum Data set (MDS); an electronic assessment tool used by home care and long term care).

A structured approach may be achieved through the use of a risk assessment scale in combination with a comprehensive skin assessment and clinical judgment. The Braden (Appendix A), Waterlow and Norton Scales have been the most widely tested risk assessment tools in terms of reliability and predictive validity. The Pressure Ulcer Risk Score; embedded in the Minimum Data Set used in home care and long term care has been found to have good predictive validity as well (Poss et al., 2010). Evidence suggests that the introduction of those elements, in conjunction with the establishment of skin-care teams, education programs, and care protocols, can reduce the incidence of pressure ulcers.

5. Use a structured approach to risk assessment that includes assessment of activity and mobility. (Strength of Evidence = C)

6. Use a structured approach to risk assessment that includes a comprehensive skin assessment to evaluate any alterations to intact skin. (Strength of Evidence = C)

6.1. Consider individuals with alterations to intact skin to be at risk of pressure ulcer development. (Strength of Evidence = C)

Alteration in skin condition may include dry skin, erythema, and other alterations. The presence of non-blanching erythema is an indication of a stage 1 pressure ulcer.

7. Use a structured approach to risk assessment that is refined through the use of clinical judgment informed by knowledge of key risk factors. (Strength of Evidence = C)

8. Consider the impact of the following factors on an individual's risk of pressure ulcer development:

a) Friction and shear

Shear and friction forces can result from sliding, involuntary movement and repositioning.

b) Sensory perception and mobility

Reduced ability to walk, change position or respond meaningfully to pressure-related discomfort may be an issue for individuals with neuromusculoskeletal conditions (eg. spinal cord injury, CVA, Multiple sclerosis, dementia) or when level of consciousness is diminished (eg anesthetized, experiencing delirium or comatose).

c) Nutritional indicators

Nutritional indicators include anemia, hemoglobin and serum albumin levels, measures of nutritional intake, and weight. Weight loss of >5% in 30 days or >10% in 180 days is considered to be significant.

d) Factors affecting perfusion and oxygenation

Factors affecting perfusion include diabetes, cardiovascular instability/norepinephrine use, low blood pressure, smoking, ankle brachial index, and oxygen use.

e) Skin moisture

Both dry skin and excessive skin moisture are risk factors (see Skin Assessment).

f) Skin temperature

Elevated tissue temperature may be a risk factor for pressure ulcer development.

g) Advanced age

Older adults are more susceptible to shearing injuries because of the flattened dermal-epidermal junction and decrease in dermal thickness (Miller, 1999).

h) Previous history of pressure ulcers (Strength of Evidence = C)

9. Conduct a structured risk assessment on admission, and repeat as regularly and as frequently as required by the individual's condition. Reassessment should also be undertaken if there is any change in condition. (Strength of Evidence = C)

10. Develop and implement a prevention plan when individuals have been identified as being at risk of developing pressure ulcers. (Strength of Evidence = C)

Risk factors identified in a risk assessment should lead to an individualized plan of care to minimize the impact of those variables.

SKIN ASSESSMENT

11. Ensure that a complete skin assessment is part of the risk assessment screening policy in place in all health care settings. (Strength of Evidence = C)

Each health care setting should have a policy in place that includes recommendations for a structured approach to skin assessment relevant to the setting, as well as for clinical areas to be targeted and the timing of assessment/reassessment. It should make clear recommendations for documenting skin assessment and communicating information to the wider health care team.

12. Educate professionals on how to undertake a comprehensive skin assessment that includes the techniques for identifying blanching response, localized heat, edema, and induration (hardness). (Strength of Evidence = B)

These additional assessment techniques can be used in caring for all individuals. However, there is evidence that Category I pressure ulcers are under-detected in individuals with darkly pigmented skin because areas of redness are not as easily seen.

13. Inspect skin at least daily for signs of redness in individuals identified as being at risk of pressure ulceration. The frequency of inspection may need to be increased in response to any deterioration in overall condition. (WRHA Expert Opinion) (Strength of Evidence = C)

14. Skin inspection should include assessment for localized heat, edema, or induration (hardness), especially in individuals with darkly pigmented skin. (Strength of Evidence = C)

Ongoing assessment of the skin is necessary to detect early signs of pressure damage. Localized heat, edema, and induration have all been identified as warning signs for pressure ulcer development. As it is not always possible to see signs of redness on darkly pigmented skin, these additional signs should be considered in assessment.

15. Ask individuals to identify any areas of discomfort or pain that could be attributed to pressure damage. (Strength of Evidence = C)

A number of studies have identified pain as a major factor for individuals with pressure ulcers. Several studies also offer some indication that pain over the site was a precursor to tissue breakdown.

16. Observe the skin to ensure that medical devices are not causing pressure damage. (Strength of Evidence = C)

Many different types of medical devices have been reported as having caused pressure damage (e.g., catheters, oxygen tubing, ventilator tubing, semi rigid cervical collars, etc.).

17. Document all skin assessments, noting details of any pain possibly related to pressure damage. (Strength of Evidence = C)

Accurate documentation is essential for monitoring the progress of the individual and to aiding communication between professionals.

SKIN CARE

- 18. Whenever possible, do not turn the individual onto a body surface that is still reddened from a previous episode of pressure loading. (Strength of Evidence = C)**

Redness indicates that the body has not recovered from the previous loading and requires further respite from repeated loading (see Etiology).

- 19. Do not use massage for pressure ulcer prevention. (Strength of Evidence = B)**

Massage is contraindicated in the presence of acute inflammation and where there is the possibility of damaged blood vessels or fragile skin. Massage cannot be recommended as a strategy for pressure ulcer prevention.

- 20. Do not vigorously rub skin that is at risk for pressure ulceration. (Strength of Evidence = C)**

As well as being painful, rubbing the skin can also cause mild tissue destruction or provoke an inflammatory reaction, particularly in the frail elderly.

- 21. Use skin emollients to hydrate dry skin in order to reduce risk of skin damage. (Strength of Evidence = B)**

Dry skin seems to be a significant and independent risk factor for pressure ulcer development. The most appropriate emollient has yet to be determined. Choose products which are pH balanced, non-sensitizing and low in alcohol. Perfumes and lanolin are known sensitizers (WRHA, 2006).

- 22. Protect the skin from exposure to excessive moisture with a barrier product in order to reduce the risk of pressure damage. (Strength of Evidence = C)**

Skin damage from moisture is not a pressure ulcer but can put individuals more at risk for pressure ulcers. The mechanical properties of the stratum corneum are changed by the presence of moisture and reduce its ability to function as a barrier. Excessive moisture also increases the friction co-efficient making the skin more susceptible to damage from friction and shear.

- 23. For individuals incontinent of urine and/or bowel identify and treat the cause when possible. Otherwise implement a toileting routine to reduce the incidence of incontinence. (WRHA Expert Opinion) (Strength of Evidence = C)**

- 24. Implement a structured perineal skin care program for individuals incontinent of urine and/or feces. (WRHA Expert Opinion) (Strength of Evidence = C).**

Cleanse the skin after each incontinence episode particularly if feces are present. Ph balanced perineal skin cleansers are preferable to soap and water. Use of emollients, barrier products and proper incontinence containment devices that wick and hold moisture away from the skin are important aspects of a perineal skin program. (Beeckman et al., 2009)

NUTRITION FOR PRESSURE ULCER PREVENTION

25. Screen and assess the nutritional status of every individual at risk of pressure ulcers in each health care setting. (Strength of Evidence = C)

Since undernutrition is a reversible risk factor for pressure ulcer development, early identification and management of under nutrition is very important. Individuals at risk of pressure ulcer development may also be at risk of under nutrition, and so should be screened for nutritional status.

25.1. Use a valid, reliable and practical tool for nutritional screening that is quick and easy to use and acceptable to both the individual and health care worker. (Strength of Evidence = C)

26. Establish a nutritional screening policy in place in all health care settings, along with recommended frequency of screening for implementation. (Strength of Evidence = C)

27. Refer each individual with nutritional risk and pressure ulcer risk to a registered dietitian and also, if needed, to a multidisciplinary nutritional team that includes a registered dietitian, a nurse specializing in nutrition, a physician, a speech and language therapist, an occupational therapist, and when necessary a dentist. (Strength of Evidence = C)

27.1. Provide nutritional support to each individual with nutritional risk and pressure ulcer risk, following the nutritional cycle. This should include:

- Nutritional assessment
- Estimation of nutritional requirements
- Comparison of nutrient intake with estimated requirements
- Provide appropriate nutrition intervention, based on appropriate feeding route
- Monitoring and evaluation of nutritional outcome, with reassessment of nutritional status at frequent intervals while an individual is at risk.

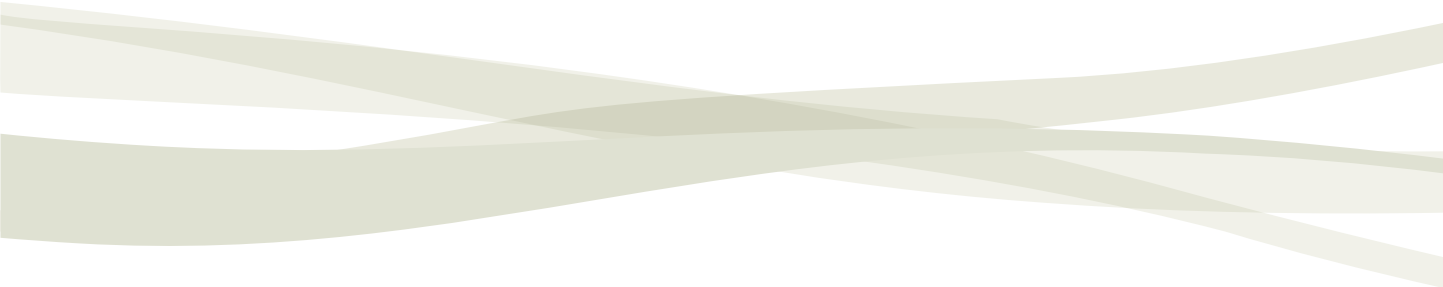
(Strength of Evidence = C)

Individuals may need different forms of nutritional management during the course of their illness.

27.2. Follow relevant and evidence based guidelines on enteral nutrition and hydration for individuals at risk of pressure ulcers, who show nutritional risks or nutritional problems. (Strength of Evidence = C)

27.3. Offer each individual with nutritional risk and pressure ulcer risk a minimum of 30-35 kcal per kg body weight per day, with 1.25-1.5 g/kg/day protein and 1ml of fluid intake per kcal per day. (Strength of Evidence = C)

28. Offer high-protein mixed oral nutritional supplements and/or tube feeding, preferably in addition to the usual diet, to individuals with nutritional risk and pressure ulcer risk because of acute or chronic diseases, or following a surgical intervention. (Strength of Evidence = A)



Oral nutrition (via normal feeding and/or with additional sip feeding) is the preferred route for nutrition, and should be supported whenever possible. Oral nutritional supplements are of value because many pressure-ulcer-prone patients often cannot meet their nutritional requirements via normal oral food intake. Moreover, oral nutritional supplementation seems to be associated with a significant reduction in pressure ulcer development, compared to routine care.

Enteral (tube feeding) and parenteral (delivered outside the alimentary tract) nutrition may be necessary when oral nutrition is inadequate or not possible, based on the individual's condition and goals.

- 28.1 Administer oral nutritional supplements and/or tube feeding in between the regular meals to avoid reduction of normal food and fluid intake during regular mealtimes. (Strength of Evidence = C)**

REPOSITIONING FOR THE PREVENTION OF PRESSURE ULCERS

General Repositioning

Note: Many of the recommendations in the repositioning and support surface sections include a consult to OT and/or PT. Depending on the individual's issues, it could be either the OT and/or PT who should be consulted for mobility, positioning and seating assessments.

- 29. The use of repositioning should be considered in all at-risk individuals. (Strength of Evidence = C)**

- 29.1. Repositioning should be undertaken to reduce the duration and magnitude of pressure over vulnerable areas of the body. (Strength of Evidence = A)**

High pressures over bony prominences, for a short period of time, and low pressures over bony prominences, for a long period of time, are equally damaging. In order to lessen the individual's risk of pressure ulcer development, it is important to reduce the time and the amount of pressure the individual is exposed to.

- 29.2. Continue to reposition the individual regardless of the support surface in use. Establish repositioning frequency based on the characteristics of the support surface and the individual's tissue response. (Strength of Evidence = C)**

- 29.3. Avoid subjecting the skin to shear forces. (Strength of Evidence = C)**

- 29.4. Do not drag the individual while repositioning or transferring. Use a friction reducing slider or mechanical lifting device if assistance is required for moving. (Strength of Evidence = C)**

Mechanical lift slings should not be left under the individual.

- 29.5. Do not position the individual directly onto medical devices, such as tubes or drainage systems. (Strength of Evidence = C)**

- 29.6. Avoid positioning the individual on bony prominences with existing non-blanchable erythema. (Strength of Evidence = C)**

Non-blanchable erythema is considered to be a stage 1 pressure ulcer.

- 29.7. Consider consulting OT and/or PT for individuals who have limited mobility, spasticity or abnormal muscle tone and do not have the ability to independently reposition themselves in bed or in a chair. An increase in activity should be facilitated as tolerated. (WRHA Expert Opinion) (Strength of Evidence = C)**

Bed Repositioning

Repositioning Frequency

- 30. Frequency of repositioning will be influenced by variables concerning the individual (Strength of Evidence = C) and the support surface in use. (Strength of Evidence = A)**

- 30.1. Repositioning frequency will be determined by the individual's tissue tolerance, level of activity and mobility, general medical condition, overall treatment objectives, and assessments of skin condition and type of support surface in use. Individuals should be turned every two hours until a personalized schedule is established. (Strength of Evidence = C)**

Turning every 2 hours for individuals at risk for pressure ulcer development is a commonly used rule of thumb. An individualized turning schedule should be developed based on the above factors.

- 30.2. Assess the individual's skin condition and general comfort with each repositioning. If the individual is not responding as expected to the repositioning regime, reconsider the frequency and method of repositioning. (Strength of Evidence = C)**

Frequent assessment of the individual's skin condition will help to identify the early signs of pressure damage and his/her tolerance of the planned repositioning schedule. If changes in skin conditions should occur, the repositioning plan needs to be reevaluated.

- 30.3 Increase activity as rapidly as tolerated. (WRHA Expert Opinion) (Strength of Evidence = C)**

Individuals on bed rest should progress to sitting and ambulation as tolerated.

Repositioning Technique

- 31. Repositioning contributes to the individual's comfort, dignity, and functional ability. (Strength of Evidence = C)**

- 31.1. Use devices to enable the individual to assist or independently position, lift and transfer (e.g. trapeze, bed rails). (Strength of Evidence = C)**

- 31.2. Do not use soakers or bed sheets to reposition or move individuals in bed. (WRHA Expert Opinion) (Strength of Evidence = C)**

- 31.3. When the individual is positioned in the supine position, the head of the bed should be flat (Diagram A) (WRHA Expert Opinion). If it is necessary to raise the head of bed, limit it to no greater than 30 degrees (Diagram B) to minimize the risk of sliding and shear forces. (Strength of Evidence = C)**



Diagram A Supine position



Diagram B Head and knee gatch raised 30 °



Diagram C 30° Side lying position

- 31.4. Individuals positioned in the lateral side lying position should be positioned at 30 degrees of side lying. (Diagram C) (Strength of Evidence = C)**

It is important to use pillows to keep bony prominences from contact with each other. A wedge cushion or pillow behind the back (above sacrum) will help the individual maintain a 30° side lying position.

- 31.4.1 To avoid pressure on the trochanter, a 90° side lying position should not be used. (Strength of Evidence = C)**

- 31.5. Sitting up in bed should be avoided. Individuals should be positioned in a wheelchair or other suitable chair for meals and activities. (WRHA Expert Opinion) (Strength of Evidence = C)**

If sitting in bed is necessary the individual should be assisted to sit at the side of the bed with their feet supported on a foot stool if he/she has the balance and function to do so. If this is not possible, first raise the knee gatch to prevent sliding and then the head of the bed. (Australia Wound Management Association 2001. p. 24) Palpate the coccyx/sacrum once in this position to ensure the individual has not “bottomed out” on the support surface in use.

Repositioning the Seated Individual

32. Position the individual to maximize his/her functional abilities while minimizing the effects of pressure and shear. (Strength of Evidence = C)

32.1. Select a posture to ensure an individual's seated position will provide the stability necessary to maintain skeletal alignment while enabling participation in meaningful activities (Diagram D). (WRHA Expert Opinion) (Strength of Evidence = C)



Diagram D Seated Posture

The individual should be seated with the pelvis in neutral, the trunk upright and in midline orientation, the shoulders level, and the head centered over the body. Armrests should be adjusted to the appropriate height to provide support to the upper extremities. The thighs should be fully supported and parallel to the floor. The feet should be supported on footrests or on a foot stool. If this position cannot be obtained and there is risk that the skin may become compromised, consult OT and/or PT.

32.2. Select a posture that optimizes the pressure redistribution and reduces shear exerted on the skin and soft tissue (Strength of Evidence = C).

For individuals who require the use of a wheelchair, a seat cushion and backrest, compatible and properly measured for the chair, are recommended to support the individual's seated posture as well as maximize pressure redistribution.

32.3. Limit the amount of time that an individual spends seated in the chair without some form of pressure redistribution. (Strength of Evidence = C).

When an individual is seated correctly in a chair, the weight of the body still causes significant exposure to pressure over bony prominences (i.e. coccyx and ischial tuberosities) regardless of the support surface in use. As the loaded area in such cases is relatively small, the pressure has the potential to remain high. Therefore, without adequate pressure redistribution, a pressure ulcer can develop very quickly.

32.3.1. Individuals who are able to reposition themselves should be taught to reposition frequently, preferably every 15 minutes by using methods such as full or partial push-ups, forward lean or side to side lean. Ideally these positions should be held for 1-2 minutes. (WRHA Expert Opinion) (Strength of Evidence = C)

When pressure is temporarily relieved, or redistributed on bony prominences, blood flow is restored and the risk of hypoxic damage reduced (RNAO, 2011). Reperfusion of the tissues can be achieved in 1-2 minutes (Sprigle, S. and Somenblum, S. (2011). If clients are not independent in repositioning, a caregiver should assist with repositioning. It is recommended this occur at least once every hour" (RNAO, 2011). The client may also benefit from a tilt wheelchair where they can be assisted to change their tilted position every 15 minutes.

32.3.2. Dynamic tilt or tilt used in combination with other dynamic wheelchair functions (such as recline) may be indicated for individuals who are unable to independently maintain or change their position. (WRHA Expert Opinion) (Strength of Evidence = C)

Tilt or tilt with recline, if not used beyond a certain range can have little impact on pressure redistribution away from certain bony prominences. It has been shown that at least 30 degrees of tilt is required for substantive pressure reduction at the ischial tuberosities and the sacrum. Smaller angles of tilt may increase pressure on the sacrum. (Giesbrecht, Ethans and Staley, 2011). Recline, used alone, has major risks associated with shear. If either tilt or recline are indicated, the individual should be referred to OT and/or PT for a full seating assessment.

32.4 Refer an individual to OT and/or PT for a full seating assessment when challenges arise for the seated individual. (WRHA Expert Opinion) (Strength of Evidence = C)

For a variety of reasons, some individuals will be unable to tolerate general guidelines for seated posture. This would include (but is not limited to) individuals with abnormal muscle tone, sensory impairment, and musculoskeletal deformities (e.g. contractures). Those individuals should be referred to OT and/or PT for a full seating assessment as they typically require more complicated seating interventions.

Common observations that indicate an individual is not tolerating standard positioning include forward leaning, leaning to the side, sliding forward on the seat, feet falling off the footrests, redness on the skin (suggesting decreased tissue tolerance), and reports of discomfort.

Repositioning Documentation

33. Record repositioning regimes, specifying frequency and positions adopted, and include an evaluation of the outcome of the repositioning regime. (Strength of Evidence = C)

It is important to include a record of the individuals' skin condition as an indicator of tolerance of the positioning plan.

Repositioning Education and Training

34. Education about the role of repositioning in pressure ulcer prevention should be offered to all persons involved in the care of individuals at risk of pressure ulcer development, including the individual and significant others (where possible). (Strength of Evidence = C)

34.1. Training in the correct methods of repositioning and use of equipment should be offered to all persons involved in the care of individuals at risk of pressure ulcer development, including the individual and significant others (where possible and appropriate). (Strength of Evidence = C)

SLEEPING AND SITTING SUPPORT SURFACES

General Recommendations

35. Ensure sleep and sitting support surfaces are properly matched to the individual's needs for pressure redistribution, shear reduction, and microclimate control over a 24-hour period. (WRHA Expert Opinion) (Strength of Evidence = C)

35.1 Select a support surface that meets the individual's needs. Do not base the selection of a support surface solely on the perceived level of risk for pressure ulcer development or the category/stage of any existing pressure ulcers. (Strength of Evidence = C)

Consider the following factors:

- Ability to carry out functional tasks
- Ability to provide care to the individual
- Ease in repositioning and transferring on and off support surface
- Comfort of the individual
- The individual's goals, values, and lifestyle
- The ability of the support surface to provide adequate pressure redistribution
- The ability of the support surface to dissipate heat and moisture (the more heat and moisture generated, the more at risk a person is for breakdown)
- The ability of the support surface to conform to body contours (envelopment)
- The level of immersion (depth of sinking into the surface)
- The number of available positions an individual can alternate between on a support surface (less available positions places an individual at higher risk for breakdown)
- The duration of time an individual can tolerate being in each position as determined by checking skin before and after each change in position

35.2. Ensure that the support surface is set up and used according to manufacturer's instructions. (WRHA Expert Opinion) (Strength of Evidence = C)

35.2.1. Verify that the support surface is being used within its functional life span, as indicated by the specific manufacturer's recommended test method (or other industry-recognized test method) before use of the support surface. (Strength of Evidence = C)

35.2.2. Ensure that the support surface is working and that the client is not bottoming out by palpating support surface areas that correlate to weight bearing bony prominences. (Strength of Evidence = C)

Assess the individual's skin condition and tissue tolerance to ensure that the support surface is providing adequate pressure redistribution.

35.2.3. If there are concerns that the support surface is not functioning properly or the client is bottoming out contact OT and/or PT and/or site equipment representative, the manufacturer, or supplier to problem solve. (WRHA Expert Opinion) (Strength of Evidence = C)

Mattress and Bed Use in Pressure Ulcer Prevention

36. Use a mattress that minimizes peak pressures over bony prominences or provides intermittent removal of pressure (WRHA Expert Opinion) (Strength of Evidence = C)

36.1. Use higher-specification foam mattresses rather than standard hospital foam mattresses for all individuals assessed as being at risk for pressure ulcer development. (Strength of Evidence = A)

36.2. There is no evidence of the superiority of one higher-specification foam mattress over alternative higher-specification foam mattresses. (Strength of Evidence = A)

36.3. Use an active support surface (overlay or mattress replacement) (see glossary) for individuals at higher risk of pressure ulcer development where frequent manual repositioning is not possible. (Strength of Evidence = B)

When high-risk individuals cannot be repositioned manually, active support surfaces are needed, as they can change their load-distribution properties.

36.4. Alternating-pressure active support overlays and replacement mattresses have a similar efficacy in terms of pressure ulcer incidence. (Strength of Evidence = A)

36.5. Do not use small-cell alternating-pressure air mattresses or overlays. (Strength of Evidence = C)

Alternating-pressure air mattresses with small air cells (diameter <10 cm) cannot be sufficiently inflated to ensure pressure redistribution over the deflated air cells.

36.6. Choose a support surface that is compatible with the care setting. (Strength of Evidence = C)

Not all support surfaces are compatible with every care setting. Support surface selection requires consideration of the weight of the bed, the structure of the home, the width of doors, the location of power outlets, the availability of uninterrupted electrical power, and the ability to promote ventilation of heat from the motor.

36.7. Identify and prevent potential complications of support surface use. (Strength of Evidence = C)

Possible complications include:

- Overlays placed on top of existing mattresses can elevate the surface nearer to the level of bed rails. The top to the bed rail should be more than 220mm (8.66 inches) above the mattress (European Standard EN60601-2-38).
- Issues of entrapment if the surface is not the same dimensions as the original mattress. Risks increase if the mattress edges compress and bed rails are in use. (Health Canada, 2008)
- High beds may be difficult to transfer in and out of, increasing the risk of falling.
- Active surfaces may be less stable than reactive support surfaces which may compromise the individual's ability to reposition or transfer in and out independently.

- Some active surfaces may be “firmed up” in order to facilitate bed mobility, transfers, and some nursing care. The original bed settings need to be resumed immediately after these activities are completed.
- Individuals on surfaces with high immersion properties are at risk of developing hip contractures and achilles tendon shortening; proper positioning and splinting can mitigate these risks.
- Mattresses that produce air flow at the skin interface can accelerate the evaporation of perspiration and can in some cases lead to dehydration. This should be considered in daily fluid intake and output (Australian Wound Management Association 2001).
- Mattresses that lead to a sensation of floating may lead to disorientation and confusion; in such cases, reorientation and explanations of the bed’s function may be helpful.
- Powered support surfaces can have motion, can be noisy and may generate heat.
- Some mattresses may bottom out when certain positions are assumed; e.g. head of bed elevated. (WRHA Expert Opinion)

36.8. Choose positioning devices and incontinence pads that are compatible with the support surface. (Strength of Evidence = C)

Plastic-backed linens, pads and dressings will block the airflow and may potentially trap heat and moisture against the patient’s skin. If plastic-backed incontinence products must be used, allow product to remain open or place them loosely against the skin to promote as much air flow as possible.

36.9. Limit the amount of linen and pads placed on the bed. (Strength of Evidence = C)

A general rule of thumb is “less is best” when selecting linens and incontinence pads to place on support surfaces to ensure that the functionality of the support surface is optimized. Apply linen according to manufacturer’s recommendations. If fitted sheets are used, ensure they are loose so as to avoid a hammock effect.

Support Surfaces to Prevent Heel Pressure Ulcers

37. Ensure that the heels do not contact the surface of the bed for individuals at high risk of developing heel pressure ulcers. (Strength of Evidence = C)

Integrated heel slopes in mattresses are often not sufficient to offload heels and thus a positioning device independent of the support surface in use will be required.

37.1. Heels can be offloaded by placing a pillow under the calves so that heels are not touching the surface (i.e., “floating”). (Strength of Evidence = B)

Use a pillow under the full length of the lower leg and calf to avoid areas of high pressure particularly under the achilles tendon. Flex the knee slightly to avoid popliteal vein compression and increased risk of deep vein thrombosis. Pillows are appropriate for short term use in alert and cooperative individuals.

- 37.2. If pillows are not effective in offloading heels, heel-protection devices can be considered. They should elevate the heel completely (offload them) in such a way as to distribute the weight of the leg along the calf without putting pressure on the Achilles tendon. The knee should be in slight flexion. (Strength of Evidence = C)**

Hyperextension of the knee may cause obstruction of the popliteal vein, and this could predispose an individual to deep vein thrombosis. It is important to consult a clinician with expertise in using heel offloading devices as inappropriate selection or application can put the individual at risk of developing pressure ulcers on other areas of the foot or leg. Once a device is applied it is important to check for proper foot position on a regular basis and conduct a thorough skin assessment if any issues with positioning are found.

- 37.3. Apply the heel device according to manufacturer's instructions. (Strength of Evidence = C)**
- 37.4. Ensure that the heel device is not too tight and does not create additional pressure. Check device placement more frequently in individuals with neuropathy, peripheral arterial disease, lower-extremity edema, or who are likely to develop edema. (Strength of Evidence = C)**
- 37.5. Remove heel devices and inspect the skin of the heels regularly. (Strength of Evidence = C)**

Inspect the skin every 8 hours or more frequently as needed.

Wheelchair and Other Sitting Support Surfaces

- 38. Use a pressure-redistributing seat cushion for individuals sitting in a chair whose mobility is reduced and who are thus at risk of pressure ulcer development. (Strength of Evidence = B)**

Different studies show that the use of a pressure-redistributing seat cushion prevents the development of pressure ulcers. No one commercially available pressure redistributing cushion has been found to significantly out-perform the others in redistributing pressure (Garber et al., 2007).

- 38.1. Consult OT and/or PT to recommend an appropriate wheelchair, including cushion and backrest. (WRHA Expert Opinion) (Strength of Evidence = C)**

Choosing an appropriate wheelchair support surface is a complex process. The seating components need to address a number of performance goals in additions to pressure redistribution (i.e. postural support, ability to propel the wheelchair, transfers and positioning for functional activity). (Giesbrecht, 2003) It is critical that the therapist prescribing seating components for individuals with neuromusculoskeletal conditions has expertise in that area.

38.1.1. Determine the effects of postural stability and asymmetries on pressure distribution by completing a comprehensive seating assessment. (WRHA Expert Opinion) (Strength of Evidence = C)

Assessment parameters should include:

- baseline sitting evaluation
- supine assessment
- supported sitting/evaluation
- body measurements
- skin inspection
- pressure mapping or other tools to evaluate interface pressures (Hastings (2000)
- seating equipment trials based on assessment results

38.1.2 Selection of cushions and cushion covers need to take into account the following factors: microclimate, amount of stretch, ease of transfers and repositioning and ease of cleaning (WRHA Expert Opinion) (Strength of Evidence = C)

38.2. Assigned wheelchairs and seating components, including cushions, are not to be interchanged between individuals. (WRHA Expert Opinion) (Strength of Evidence = C)

38.3. Inspect and maintain all aspects of the wheelchair and seating components at appropriate intervals to ensure proper functioning and that individual's needs are met. (WRHA Expert Opinion) (Strength of Evidence = C)

38.4. Consideration of a pressure-redistributing surface should also be given to other sitting surfaces. This includes, but is not limited to, toilet seats, bath seats, car seats, etc. (WRHA Expert Opinion) (Strength of Evidence = C)

Assessment of alternate sitting surfaces should be completed with at risk individuals. Individuals who spend an increased amount of time seated on alternate seated surfaces should be referred to OT and/or PT. Padding on these surfaces, i.e. bath seat, toilet seat, car seat should be considered if at risk for pressure ulcer development.

Use of other support surfaces in pressure ulcer prevention

39. Natural sheepskin pads might assist in preventing pressure ulcers. (Strength of Evidence = B)

Some studies show that the use of natural sheepskin on top of mattresses might help in the prevention of pressure ulcers (NPUAP/EPUAP, 2009) because of its ability to decrease friction and improve vapor loss) but are generally felt to be a comfort measure at best. (WRHA Expert Opinion)

Sheepskin pads are considered single patient use with appropriate means to regularly launder them.

40. Do not use synthetic sheepskin pads, cutout, ring, or donut-type devices or water-filled gloves. (Strength of Evidence = C)

Synthetic sheep skins become knotted after washing and the knots cause pressure. Rings or donut devices can cause ischemia over the pressure area. Water filled gloves are ineffective for pressure redistribution as the heels easily move off of the glove.

SPECIAL POPULATIONS

Most guidelines available up until now have provided general recommendations that did not address the special needs of patients in the operating room, critically ill, and bariatric individuals. The recommendations that follow address the unique needs of these special populations in relation to pressure redistribution, shear reduction, and microclimate control. All of the general recommendations should be followed in addition to these.

Patients in the Operating Room

41. Refine risk assessment of individuals undergoing surgery by examining other factors that are likely to occur and will increase risk of pressure ulcer development, including:
 - a) Length of the operation and duration of time where repositioning cannot occur
 - b) Increased hypotensive episodes intraoperatively
 - c) Low core temperature during surgery
 - d) Reduced mobility on day one postoperatively (Strength of Evidence = C)

42. Use a pressure-redistributing mattress on the operating table for all individuals identified as being at risk of pressure ulcer development. (Strength of Evidence = B)

Several operating-room support surfaces that encourage pressure redistribution have been developed.

43. Position the patient in such a way as to reduce the risk of pressure ulcer development during surgery. (Strength of Evidence = C)
44. Elevate the heels completely (offload them) in such a way as to distribute the weight of the leg along the calf without putting all the pressure on the achilles tendon. The knee should be in slight flexion. (Strength of Evidence = C)

Hyperextension of the knee may cause obstruction of the popliteal vein, and this could predispose the individual to deep vein thrombosis.

45. Pay attention to pressure redistribution prior to and after surgery. (Strength of Evidence = C)
 - 45.1. Place the individual on a pressure-redistributing mattress both prior to and after surgery. (Strength of Evidence = C)
 - 45.2. Position the individual in a different posture preoperatively, as well as postoperatively, than the posture adopted during surgery. (Strength of Evidence = C)

Critically Ill Individuals

46. Consider the need to change support surfaces for individuals with poor local and systemic oxygenation and perfusion to improve pressure redistribution, reduce shear, control microclimate and utilize additional features (e.g., turn assistance, percussion) as needed. (Strength of Evidence = C)

47. Consider the need to change support surfaces for individuals who cannot be turned for medical reasons such as spinal instability, hemodynamic instability and increased intracranial pressure. Resume routine repositioning as soon as these conditions stabilize. (Strength of Evidence = C)

48. Consider slow, gradual turns allowing sufficient time for stabilization of hemodynamic and oxygenation status. (Strength of Evidence = C)

Some individuals are truly too unstable to turn. However, turning the individual more slowly or in small increments that allow adequate time for stabilization of vital signs should be considered when possible.

49. Consider more frequent small shifts in position to allow some reperfusion in individuals who cannot tolerate frequent major shifts in body position. Small shifts do not replace support-surface changes when needed or turning (major shifts in body position) when possible. (Strength of Evidence=C)

50. Prevent shear injury when lateral-rotation features are used. Assess skin frequently for shear injury. Secure the individual with bolster pads (provided by the manufacturer) to prevent sacral shearing when lateral-rotation features are selected for individuals without pressure ulcers. The individual should be aligned properly in the center of the surface. (Strength of Evidence = C)

50.1. Continue to turn the individual and assess skin for pressure and shear damage. Discontinue lateral rotation at the first sign of tissue damage, and re-evaluate the individual and the support surface. (Strength of Evidence =C)

BARIATRIC (OBESE) INDIVIDUALS

Bed and Mattress Selection

51. Fit the individual to the bed and mattress from the time of admission. (Strength of Evidence = C)

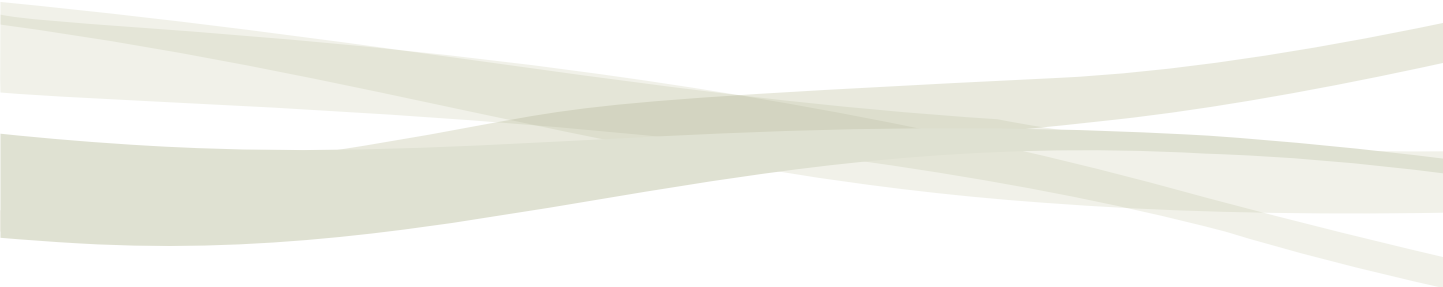
51.1. Use beds and mattresses with appropriate weight capacity for the individual. (Strength of Evidence = C)

51.2. Check for “bottoming out” of the mattress by palpating in the areas correlating to bony prominences. (Strength of Evidence = C)

51.3. Ensure that the bed surface is sufficiently wide to allow repositioning on all turning surfaces. (Strength of Evidence = C)

51.4. Confirm that the width of the bariatric individual does not reach the side rails of the bed when the individual is turned side-to-side. (Strength of Evidence = C)

51.5. Consider using features that provide air flow over the surface of the skin to facilitate fluid evaporation if the skin is excessively moist or hot (e.g. low air loss bed). (Strength of Evidence = C)



Equipment Selection

- 52. Use a wheelchair and chair wide enough to accommodate the individual's girth. (Strength of Evidence = C)**
- 53. Provide bariatric walkers, overhead trapezes on beds, and other devices to support continued mobility and independence. (Strength of Evidence = C)**

Assessment and Positioning

- 54. Get adequate assistance to fully inspect all skin folds. (Strength of Evidence = C)**

Pressure ulcers may develop in unique locations, such as beneath folds of skin and in locations where tubes and other devices have been compressed between skin folds. Pressure ulcers develop over bony prominences, but may also result from tissue pressure across the buttocks and other areas of high adipose tissue concentration.
- 55. Avoid pressure on skin from tubes and other medical devices. (Strength of Evidence = C)**
- 56. Use pillows or other positioning devices to offload pannus or other large skin folds and prevent skin-on-skin pressure and moisture trapping. (Strength of Evidence = C)**
- 57. Refer to OT and/or PT for assessment of transfers, equipment, repositioning, and seating and bed surface needs (WRHA Expert Opinion). (Strength of Evidence = C)**

APPENDIX A

BRADEN SCALE FOR PREDICTING PRESSURE SORE RISK

Patient's Name _____	Evaluator's Name _____				Date of Assessment _____			
SENSORY PERCEPTION ability to respond meaningfully to pressure-related discomfort	1. Completely Limited Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminished level of consciousness or sedation OR limited ability to feel pain over most of body.	2. Very Limited Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness OR has a sensory impairment which limits the ability to feel pain or discomfort over ½ of body.	3. Slightly Limited Responds to verbal commands, but cannot always communicate discomfort or the need to be turned OR has some sensory impairment which limits ability to feel pain or discomfort in 1 or 2 extremities.	4. No Impairment Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.				
MOISTURE degree to which skin is exposed to moisture	1. Constantly Moist Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.	2. Very Moist Skin is often, but not always moist. Linen must be changed at least once a shift.	3. Occasionally Moist Skin is occasionally moist, requiring an extra linen change approximately once a day.	4. Rarely Moist Skin is usually dry, linen only requires changing at routine intervals.				
ACTIVITY degree of physical activity	1. Bedfast Confined to bed.	2. Chairfast Ability to walk severely limited or non-existent. Cannot bear own weight and/or must be assisted into chair or wheelchair.	3. Walks Occasionally Walks occasionally during day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.	4. Walks Frequently Walks outside room at least twice a day and inside room at least once every two hours during waking hours.				
MOBILITY ability to change and control body position	1. Completely Immobile Does not make even slight changes in body or extremity position without assistance.	2. Very Limited Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.	3. Slightly Limited Makes frequent though slight changes in body or extremity position independently.	4. No Limitation Makes major and frequent changes in position without assistance.				
NUTRITION usual food intake pattern	1. Very Poor Never eats a complete meal. Rarely eats more than ¼ of any food offered. Eats 2 servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement OR is NPO and/or maintained on clear liquids or IVs for more than 5 days.	2. Probably Inadequate Rarely eats a complete meal and generally eats only about ½ of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement OR receives less than optimum amount of liquid diet or tube feeding.	3. Adequate Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) per day. Occasionally will refuse a meal, but will usually take a supplement when offered OR is on a tube feeding or TPN regimen which probably meets most of nutritional needs.	4. Excellent Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.				
FRICTION & SHEAR	1. Problem Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures or agitation leads to almost constant friction.	2. Potential Problem Moves feebly or requires minimum assistance. During a move skin probably slides to some extent against sheets, chair, restraints or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.	3. No Apparent Problem Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair.					
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The Braden Q scale, adapted for pediatric patients, can be downloaded at www.mc.vanderbilt.edu/learning-center/publist.html

REFERENCES

- Arledge, S., Armstrong, W., Babinec, M., Dicianno, B.E., Dgiovine, C., Dyson-Hudson, T., . . . Stogner, J. (2011). *RESNA wheelchair service provision guide*. Retrieved from <http://www.resna.org/dotAsset/22485.pdf>
- Australian Wound Management Association (2001). *Clinical practice guidelines for the prediction and Prevention of pressure ulcers*. West Leederville: Cambridge Publishing.
- Beekman, D., Schoonhoven, L., Verhaeghe, S., Heyneman, A., & Defloor, T. (2009). Prevention and treatment of incontinence-associated dermatitis: Literature review. *Journal of Advanced Nursing*, 65(6), 1141-1154.
- Buss, I.C., Halfens, R.J.G., & Abu-Saad, H.H. (2002). The most effective time interval for repositioning subjects at risk of pressure sore development: A literature review. *Rehabilitation Nursing*, 27, 59-77. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1002/j.2048-7940.2002.tb01986.x/abstract>
- Dicianno, B. E., Arva, J., Lieberman, J. M., Schmeler, M. R., Souza, A., Phillips, K., ... & Betz, K. L. (2009). RESNA position on the application of tilt, recline, and elevating legrests for wheelchairs. *Assistive Technology*, 21(1), 13-22. Retrieved from http://www.resna.org/resources/position-papers/RESNA_Application_Tilt_Wheelchairs.pdf
- Fleck, C. A. & Sprigle, S. (2007) Support surfaces: tissue integrity, terms, principles, and choice. In: DL Krasner, GT Rodeheaver, GT Sibbald, Eds, *Chronic Wound Care: A Clinical Source Book for Health care Professionals*. (4th ed.) (pp 629-40) Malvern, Pa: HMP Communications.
- Garber, S.L., Reddy, N. P. McLane, K.M., and Krouskop, T.A. (2007). In: Krasner, DL, Rodeheaver, GT., Sibbald, GT, eds, *Chronic Wound Care: A Clinical Source Book for Health care Professionals*. 4th ed. Malvern, Pa: HMP Communications, 2007: 641-645.
- Giesbrecht, EM. (2003). *A therapist's guide to pressure ulcer prevention and management*. (2nd ed); Winnipeg, MB; Department of Occupational Therapy, Health Sciences Centre.
- Giesbrecht, EM., Ethans, KD, & Staley, D. (2011). Measuring the effect of incremental angles of wheelchair tilt on interface pressure among individuals with spinal cord injury. *Spinal Cord*, 1-5.
- Health Canada. (2008). *Adult hospital beds: Patient entrapment hazards, side rail latching reliability, and other hazards*. Ottawa, ON: Minister of Supply and Services Canada.
- Lachenbruch, C. (2005). Skin cooling surfaces: estimating the importance of limiting skin temperature. *Ostomy wound management*, 51(2), 70-79. Retrieved from <http://www.o-wm.com/content/skin-cooling-surfaces-estimating-importance-limiting-skin-temperature>
- Michael, S.M., Porter, D., & Pounteney, T.E. (2007). Tilted seat position for non-ambulant individuals with neurological and neuromuscular impairment: A systematic review. *Clinical Rehabilitation*, 21, 1063-1074. Retrieved from <http://cre.sagepub.com/content/21/12/1063.full.pdf+html>
- Miller, C. (1999). *Nursing Care of Older Adults*. (3rd ed.) Philadelphia: Lippincott Williams & Wilkins.
- National Pressure Ulcer Advisory Panel (NPUAP) and European Pressure Ulcer Advisory Panel (EPUAP) (2009). *Pressure ulcer prevention and treatment: Clinical Practice guideline*. Washington DC: National Pressure Ulcer Advisory Panel.
- New South Wales Agency for Clinical Innovation (n.d.). *Spinal seating program: Module 8, pressure management*. Retrieved from http://www.aci.health.nsw.gov.au/networks/spinal-seating/8_pressure
- Norton, L., Coutts, P., & Sibbald, G. (2011). Beds: Practical pressure management for surfaces/mattresses. *Advances in Skin & Wound Care*, 24, 324-332. Retrieved from http://journals.lww.com/aswcjournal/Abstract/2011/07000/Beds_Practical_Pressure_Management_for.9.aspx

Norton, L., & Sibbald, R. G. (2004). Is bed rest an effective treatment modality for pressure ulcers?. *Ostomy Wound Management*, 50, 40-52. Retrieved from <http://www.o-wm.com/content/is-bed-rest-an-effective-treatment-modality-pressure-ulcers>

Poss, J, Murphy, KM., Woodbury, MG., Orsted, H., Stevenson, K., Williams, G., MacAlpine, S., Curtin-Telegdi, N., and Hirdes, JP. (2010). Development of the interRAI Pressure Ulcer Risk Scale (PURS) for use in long-term care and home care settings. *BMC Geriatrics*, (10)67 retrieved from <http://www.biomedcentral.com/info/authors>

Pressure Ulcer Expert Working Group. (2010). Pressure ulcer prevention: *Pressure, shear, friction and microclimate in context*. A consensus document. London, Wounds International. Retrieved from http://www.woundsinternational.com/pdf/content_8925.pdf

Regan, M., Teasell, R.W., Keast, DI, Aubut, J.L., Foulon, B.L., Mehta, S. (2010). Pressure Ulcers Following Spinal Cord Injury. Regan, M., Teasell, R. W., Keast, D., Aubut, J., Foulon, B.L. & Mehta, S. (2010). Pressure ulcers following spinal cord injury. *Spinal Cord Injury Rehabilitation Evidence*. JJ Eng, RW Teasell, WC Milleret al. Vancouver. Version 3.0. Retrieved from http://www.scireproject.com/sites/default/files/pressure_ulcers.pdf

RNAO. (2011). Nursing best practice guideline: Risk assessment and prevention of pressure ulcers. Toronto: RNAO.

Sprigle, S. and Somenblum, S. (2011). Assessing evidence supporting redistribution of pressure for pressure ulcer prevention: A review. *Journal of Rehabilitation Research and Development*. 48(3) 203-14.

Sprigle, S., & Sonenblum, S. (2011). Assessing evidence supporting redistribution of pressure for pressure ulcer prevention: A review. *Journal of Rehabilitation Research & Development*, 48, 203-214. Retrieved from <http://www.rehab.research.va.gov/jour/11/483/page203.html>

Stocton, L.; Gebhart, KS; Clark M. (2009). Seating and pressure ulcers: Clinical practice guideline. Liverpool: University of Liverpool.

WRHA. (2006). *WRHA Regional Wound Care Recommendations*.



PRESSURE ULCER TREATMENT

CLINICAL PRACTICE GUIDELINE



Winnipeg Regional
Health Authority
Caring for Health

Office régional de la
santé de Winnipeg
À l'écoute de notre santé

November 2012

PRESSURE ULCER TREATMENT RECOMMENDATIONS

CLASSIFICATION OF PRESSURE ULCERS

- 58. Use a validated pressure ulcer classification system to document the level of tissue loss. (Strength of Evidence = C)**
As published in this guideline, use the NPUAP-EPUAP international classification system.
- 59. Do not use a pressure ulcer classification system to describe tissue loss in wounds other than pressure ulcers. (Strength of Evidence = C)**
- 60. Educate the professional about special assessment techniques to be used in darkly pigmented individuals. (Strength of Evidence = B)**
 - 60.1. Intact Skin: Category/Stage I pressure ulcers and suspected deep-tissue injury may be difficult to detect with visual inspection alone in darkly pigmented individuals. Assess differences in skin temperature, skin color, tissue consistency (i.e., boggy or firm) and pain between affected areas and normal tissue when skin is intact. (Strength of Evidence = B)**
 - 60.2. Open Pressure Ulcers: Inflammatory redness from cellulitis and deeper tissue damage may be difficult to detect in darkly pigmented individuals. Assess the skin for heat, tenderness, pain or change in tissue consistency to identify the extent of inflammation and possible cellulitis and/or undermining in pressure ulcers presenting as open pressure ulcers (i.e. Category/Stage II, III, IV and unstageable ulcers). (Strength of Evidence = C)**
- 61. Educate the professional on differentiating pressure ulcers from other types of wounds (e.g., venous ulcers, arterial ulcers, neuropathic ulcers, incontinence-associated dermatitis, skin tears, and intertrigo). (Strength of Evidence = C)**
- 62. Educate the professional about the appropriate use of the classification system and the appearance of different tissue types at common pressure ulcer sites. (Strength of Evidence = B)**
- 63. Confirm the reliability of classifications among the professionals responsible for classifying pressure ulcers. (Strength of Evidence = B)**
- 64. Do not classify pressure ulcers on mucous membranes. (Strength of Evidence = C)**

ASSESSMENT AND MONITORING OF HEALING

Assessment of the Individual with a Pressure Ulcer

- 65. Complete a comprehensive initial assessment of the individual with a pressure ulcer. (Strength of Evidence = C)**

Assessment parameters should include:

- ☐ The individual's and family's goals of care. If the individual is unable to participate, consult with family and/or significant others.
- ☐ Investigation and assessment of all the potential causative factors that led to the development of the pressure ulcer.
- ☐ A complete health/medical and social history.
- ☐ A focused physical examination that includes:
 - Factors that may affect healing (e.g., impaired perfusion, impaired sensation, systemic infection)
 - Vascular assessment in the case of extremity ulcers (e.g., physical examination, history of claudication, and ankle-brachial index or toe pressure)
 - Laboratory tests and x-rays as needed
- ☐ Nutritional assessment (see Nutrition section of this guideline).
- ☐ Pain related to pressure ulcers (see Pain section of this guideline).
- ☐ Risk for developing additional pressure ulcers (see Prevention section of this guideline).
- ☐ Psychological health, behavior and cognition.
- ☐ Social and financial support systems.
- ☐ Functional capacity, particularly in regard to positioning, posture, and the need for assistive equipment and personnel.
- ☐ The ability to manage pressure-redistribution maneuvers.
- ☐ Adherence to pressure-redistribution maneuvers.
- ☐ Integrity and functionality of seating and bed surfaces (wear and tear).
- ☐ The individual's/family member's knowledge and belief about developing and healing pressure ulcers.

- 66. Reassess the individual if the ulcer does not show signs of healing as expected despite adequate local wound care, pressure offloading, and nutrition. (Strength of Evidence = C)**

66.1. Expect some signs of healing in most individuals within 2 weeks. (Strength of Evidence = B)

66.2. Adjust expectations in the presence of multiple factors (particularly unmodifiable factors) that impair wound healing (e.g., persistent undernutrition, poor perfusion, and co-morbidities known to impair wound healing). (Strength of Evidence = B)

66.3. Teach the individual and their family about the normal healing process and keep them informed about progress (or lack of progress) toward healing, including signs and symptoms that should be brought to the professional's attention. (Strength of Evidence = C)

Pressure Ulcer Assessment

- 67. Assess the pressure ulcer initially and re-assess it at least weekly, documenting findings. (Strength of Evidence = C)**

A 2-week period is recommended for evaluating progress toward healing. However, weekly assessments provide an opportunity for the health care professional to detect early complications and the need for changes in the treatment plan.

- 68. With each dressing change, observe the pressure ulcer for developments that may indicate the need for a change in treatment (e.g., wound improvement, wound deterioration, more or less exudate, signs of infection, or other complications). (Strength of Evidence = C)**
- 69. Assess and accurately document physical characteristics such as location, category/stage, size, tissue type(s), wound bed and periwound condition, wound edges, sinus tracts, undermining, tunneling, exudate, necrotic tissue, odor, presence/absence of granulation tissue, and epithelialization. (Strength of Evidence = C)**
- 70. Position the individual in a consistent neutral position for wound measurement. (Strength of Evidence = C)**

70.1. Length and width: Select a uniform, consistent method for measuring wound length and width to facilitate meaningful comparisons of wound measurements across time. (Strength of Evidence = B)

It is recommended to identify length as the longest measurement of the wound and the width as the longest measurement perpendicular to the length (WRHA, 2006).

70.2. Wound depth, tunneling, and undermining: Select a consistent, uniform method for measuring depth. Care should be taken to avoid causing injury when probing the depth of a wound bed or determining the extent of undermining or tunneling. (Strength of Evidence = C)

Depth should be measured by measuring the deepest point of the wound base perpendicular to the wound edge (WRHA, 2006).

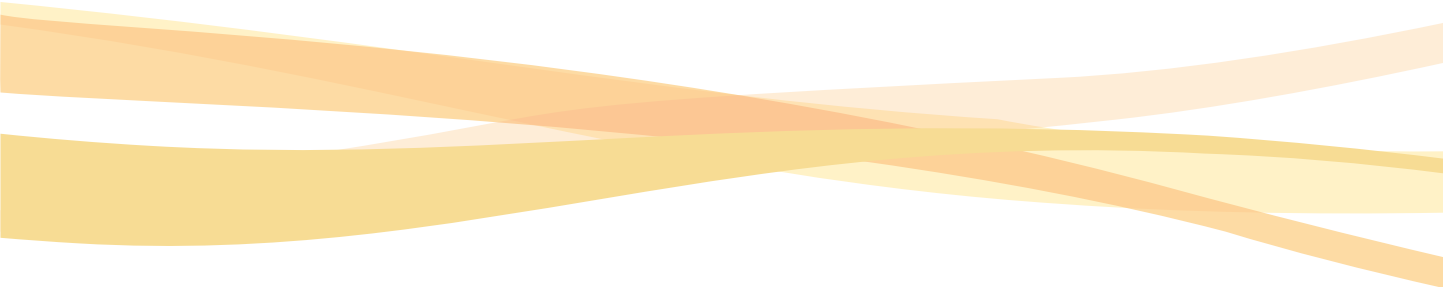
- 71. Use pressure ulcer assessment findings to plan interventions that will best promote healing. (Strength of Evidence = C)**

The treatment needs of a pressure ulcer change over time, in terms of both healing and deterioration. Treatment strategies should be continuously re-evaluated based on the current status of the ulcer.

Methods for Monitoring Healing

- 72. Regularly assess progress towards healing. (Strength of Evidence = C)**

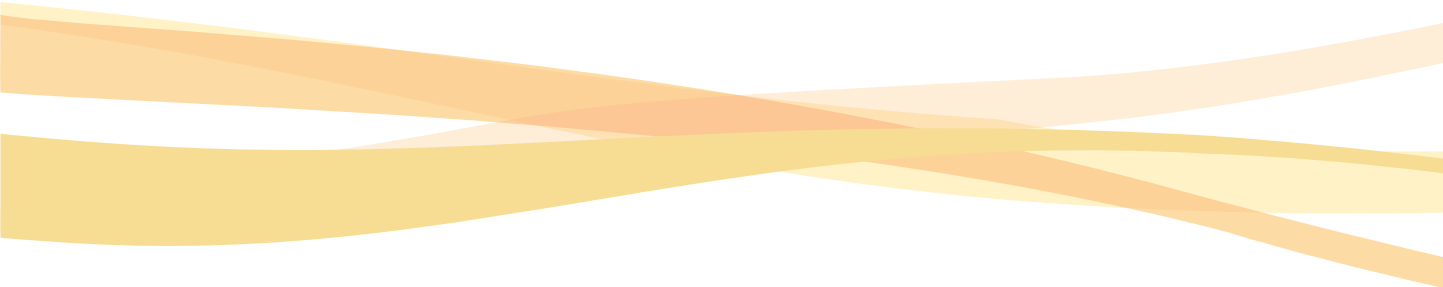
72.1. Use a validated tool such as the Pressure Ulcer Scale for Healing (PUSH®) Tool or the Bates-Jensen Wound Assessment Tool (BWAT) (Appendix A), formerly known as the Pressure Sore Status Tool (PSST). (Strength of Evidence = B)

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- 72.2. Use clinical judgment to assess signs of healing such as decreasing amount of exudate, decreasing wound size, and improvement in wound bed tissue. (Strength of Evidence = C)
 - 72.3. Consider using baseline and serial photographs to monitor pressure ulcer healing over time. Use standard photographic techniques with appropriate consent. (Strength of Evidence = C)
 - 72.4. Consider the use of reliable and valid electronically assisted data-collection devices. (Strength of Evidence = C)
 - 73. Re-evaluate the pressure ulcer, the plan of care, and the individual if the pressure ulcer does not show progress toward healing within 2 weeks (or as expected given the individual's overall condition and ability to heal). (Strength of Evidence = C)
 - 73.1. Signs of deterioration should be addressed immediately. (Strength of Evidence = C)

Nutrition in Pressure Ulcer Healing

- 74. Screen and assess nutritional status for each individual with a pressure ulcer at admission and with each condition change — and/or when progress toward pressure ulcer closure is not observed. (Strength of Evidence = C)
 - 74.1. Refer all individuals with a pressure ulcer to a dietitian for early assessment of and intervention for nutritional problems. (Strength of Evidence = C)
 - 74.2. Assess weight status for each individual to determine weight history and significant weight loss from usual body weight (> 5% change in 30 days or > 10% in 180 days). (Strength of Evidence = C)
 - 74.3. Assess the individual's ability to eat independently. (Strength of Evidence = C)
 - 74.4. Assess the adequacy of total nutrient intake (food, fluid, oral supplements, enteral/parenteral feedings). (Strength of Evidence = C)
 - 74.5. Assess nutritional indicators including anemia, hemoglobin and serum albumin and pre-albumin levels, measures of nutritional intake, and weight. (WRHA Expert Opinion) (Strength of Evidence = C)

Weight loss of >5% in 30 days or >10% in 180 days is considered to be significant.
- 75. Provide sufficient calories. (Strength of Evidence = B)
 - 75.1. Provide 30-35 kcalories/kg body weight for individuals under stress with a pressure ulcer. Adjust formula based on weight loss, weight gain, or level of obesity. Individuals who are underweight or who have had significant unintentional weight loss may need additional kcalories to cease weight loss and/or regain lost weight. (Strength of Evidence = C)
 - 75.1.1 Due to variation in energy requirements in individuals with pressure ulcers, energy expenditure should be evaluated by indirect calorimetry when available. (WRHA Expert Opinion). (Strength of Evidence = C)

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- 75.1.2 Due to variations in energy expenditure, it is recommended that energy requirements be individually assessed in spinal cord injury patients with pressure ulcers, using indirect calorimetry if possible. Regular weight monitoring is recommended as a valid and non-invasive method to determine whether a patient is anabolic, catabolic or in a stable metabolic state. (WRHA Expert Opinion) (Strength of Evidence = C)
- 75.2. Revise and modify (liberalize) dietary restrictions when limitations result in decreased food and fluid intake. These adjustments are to be managed by a dietitian or medical professional. (Strength of Evidence = C)
- 75.3. Provide enhanced foods and/or oral supplements between meals if needed. (Strength of Evidence = B)
- 75.4. Consider nutritional support (enteral or parenteral nutrition) when oral intake is inadequate. This must be consistent with the individual's goals. (Strength of Evidence = C)
76. Provide adequate protein for positive nitrogen balance for an individual with a pressure ulcer. (Strength of Evidence = B)
- 76.1. Offer 1.25 to 1.5 grams protein/kg body weight daily for an individual with a pressure ulcer when compatible with goals of care, and reassess as condition changes. (Strength of Evidence = C)
- 76.2. Assess renal function to ensure that high levels of protein are appropriate for the individual. (Strength of Evidence = C)
77. Provide and encourage adequate daily fluid intake for hydration. (Strength of Evidence = C)
- 77.1. A minimum of 1 ml/kcal/day (30-35ml/kg/day) is a general guideline to meet fluid requirements for individuals with pressure ulcers. (WRHA Expert Opinion) (Strength of Evidence = C)
- 77.2. Monitor individuals for signs and symptoms of dehydration: changes in weight, skin turgor, urine output, elevated serum sodium, or calculated serum osmolality. (Strength of Evidence = C)
- 77.3. Provide additional fluid for individuals with dehydration, elevated temperature, vomiting, profuse sweating, diarrhea, or heavily draining wounds. (Strength of Evidence = C)
78. Provide adequate vitamins and minerals. (Strength of Evidence = B)
- 78.1. Encourage consumption of a balanced diet that includes good sources of vitamins and minerals. (Strength of Evidence = B)
- 78.2. Offer vitamin and mineral supplements when dietary intake is poor or deficiencies are confirmed or suspected. (Strength of Evidence = B)
79. Maintain glycemic control. (WRHA Expert Opinion) (Strength of Evidence = C)
- Maintenance of normal blood glucose levels is key for optimal wound healing.
- 79.1 Assess glycemic control by measuring fasting blood glucose and glycosylated hemoglobin. (WRHA Expert Opinion) (Strength of Evidence = C)

PAIN ASSESSMENT AND MANAGEMENT

Refer to the WRHA Pain Assessment and Management Clinical Practice Guideline 2008 found at <http://home.wrha.mb.ca/prog/clinicalinitiatives/painassess/index.php>

Pain Assessment

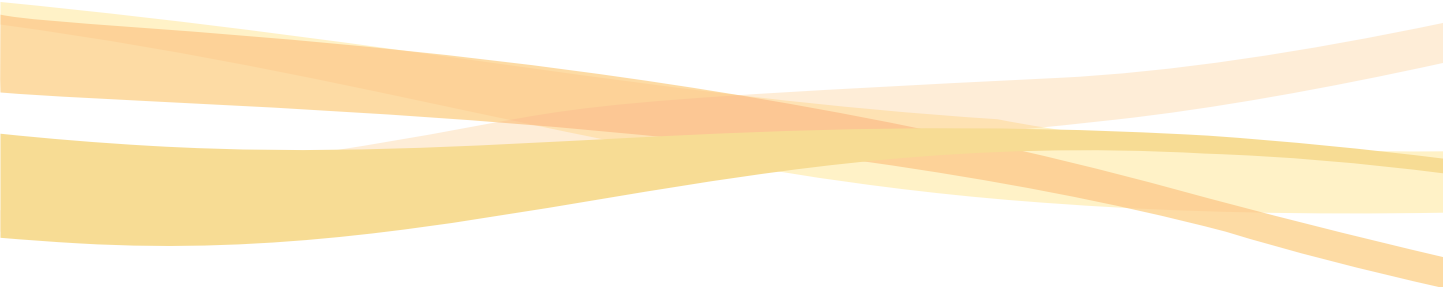
- 80. Assess all individuals for pain related to a pressure ulcer or its treatment. (Strength of Evidence = B)
- 81. Assess for pressure-ulcer-related pain in adults using a validated scale. (Strength of Evidence = B)
- 82. Assess for pain in neonates and children using a validated scale. (Strength of Evidence = C)
 - 82.1. Use the CRIES (Crying; Requires O₂ for Saturation >95%; Increasing vital signs; Expression; Sleepless) Scale for neonates up to 6 months. (Strength of Evidence = C)
 - 82.2. Use the FLACC (Face, Leg, Activity, Cry, and Consolability) tool for children 2 months to 7 years of age. (Strength of Evidence = C)
- 83. Pain assessment should include an assessment of body language and nonverbal cues (e.g., change in activity, loss of appetite, guarding, grimacing, and moaning). (Strength of Evidence = C)

Pain Prevention

- 84. Use a mechanical lift or friction reducing slider to minimize friction and/or shear when repositioning an individual, keeping bed linens smooth and unwrinkled. (Strength of Evidence = C)
- 85. Position the individual off of the pressure ulcer whenever possible (see Support Surface and Repositioning section). (Strength of Evidence = C)
- 86. Avoid postures that increase pressure, such as sitting positions greater than 30° or a 90° side-lying position. (Strength of Evidence = C)
- 87. Minimize pressure ulcer pain by handling all wounds gently; flushing and not rubbing unnecessarily during cleansing; and protecting the periwound skin. (Strength of Evidence = C)

Pain Management

- 88. Organize care delivery to ensure that it is coordinated with pain medication administration and that minimal interruptions follow. Set priorities for treatment. (Strength of Evidence = C)
- 89. Encourage individuals to request a “time out” during any procedure that causes pain. (Strength of Evidence = C)
- 90. Reduce pressure ulcer pain by keeping the wound bed covered and moist, and using a non-adherent dressing. (Note: Stable dry eschar is usually not moistened.) (Strength of Evidence = B)
- 91. Use dressings less likely to cause pain and/or those likely to require less frequent dressing changes (e.g., hydrocolloids, hydrogels, alginates, polymeric membrane foams, foam, soft silicone dressings, and ibuprofen-impregnated dressings). Note: Gauze dressings are more likely to cause pain. See Dressings section for further information. (Strength of Evidence = C)

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92. For an individual with pain from a pressure ulcer, music, meditation, distraction, conversations, and guided imagery are sometimes beneficial. (Strength of Evidence = C)
 93. Administer pain medication regularly, in the appropriate dose following the World Health Organization Dosing Ladder. (Strength of Evidence = C)
 94. Anticipate incident pain and combine pharmacological and non-pharmacological options for prevention. (WRHA Expert Opinion) (Strength of Evidence = C)

Incident Pain is pain which comes on as a result of an action or activity (such as planned turns, transfers/ambulation, bathing, changing clothes, dressing changes, disimpaction).
 95. Encourage repositioning as a means to reduce pain, if consistent with the individual's wishes. (Strength of Evidence = C)

Debridement Pain

96. Use adequate pain-control measures, including additional dosing at times of wound manipulation, wound cleansing, dressing change, debridement, etc. (Strength of Evidence = C)
97. In refractory cases, consider topical opioids to reduce or eliminate pressure ulcer pain. Topical morphine (mixed with hydrogel) may be effective. (WRHA Expert Opinion) (Strength of Evidence = C)

Anecdotal/small case series/small trials suggest topical morphine can be effective for some patients. Topical morphine (mixed with hydrogel) can be prepared by a compounding pharmacy and is not listed on the WRHA formulary.
98. Apply topical medications according to manufacturer's directions to allow adequate time for action prior to wound treatments. (Strength of Evidence = C)

Chronic Pain Management

99. Manage persistent pressure ulcer pain of neuropathic origin with a local anesthetic or adjuvant agents (tricyclic antidepressant or epileptic (i.e. gabapentin) as well as transcutaneous nerve stimulation or warm applications. (WRHA Expert Opinion) (Strength of Evidence = C)

Local anesthetics may be used on the periwound area. There can be concerns with applying local anesthetics to irritated or broken skin due to increased systemic absorption and toxicity.
100. Refer the individual with chronic pain related to pressure ulceration to the appropriate pain and/or wound clinic resources. (Strength of Evidence = C)

Educate Individuals, Family and Health Care Providers

101. Educate the individuals, caregivers, and health care providers about causes, assessment and management of pressure ulcer pain. (Strength of Evidence = C)

REPOSITIONING FOR THE TREATMENT OF PRESSURE ULCERS

Note: Many of the recommendations in the repositioning and support surface sections include a consult to OT and/or PT. Depending on the individual's issues, it could be either the Occupational Therapist (OT) or Physical Therapist (PT) who should be consulted for mobility, positioning and seating assessments.

GENERAL REPOSITIONING

102. Repositioning is required with all individuals who have developed a pressure ulcer.

102.1 Do not position an individual directly on a pressure ulcer. (Strength of Evidence = C)

102.2 An assessment is required to determine which positions will effectively off-load a pressure ulcer. (WRHA Expert Opinion) (Strength of Evidence = C)

Ideally pressure on a pressure ulcer should be avoided. If full offloading is not possible, limit the time spent with pressure on the ulcer seeking OT and/ or PT guidance to determine the optimum positions and positioning schedule and support surface to be used. (RNAO, 2011)

102.3. Consider potential complications if total bedrest is prescribed to create a pressure-free wound environment. (WRHA Expert Opinion) (Strength of Evidence = C)

Potential complications include: physical complications, e.g. muscle wasting, deconditioning, respiratory issues, joint contractures/limitations, psychological harm, social isolation, and financial challenges.

Balancing physical, social, and psychological needs against the need for total offloading (i.e. total bed rest) creates a challenging dilemma for the individual and the professional (Keast et al., 2006) and requires a collaborative approach to optimize the opportunity for healing to occur.

102.4 Continue to reposition the individual regardless of the support surface in use. Establish repositioning frequency based on the characteristics of the support surface and the individual's tissue response after an interval of time in a specific position. (Strength of Evidence = C)

102.5. Use transfer aids to reduce friction and shear. Use a friction reducing slider or mechanical lifting device. Do not leave moving and handling equipment under the individual after use, i.e mechanical lift slings. (Strength of Evidence = C)

102.6. Consider consulting OT and/or PT for individuals who have limited mobility, spasticity or abnormal muscle tone and do not have the ability to independently reposition themselves in bed or in a chair. An increase in activity should be facilitated as tolerated. (WRHA Expert Opinion) (Strength of Evidence = C)

BED REPOSITIONING

Repositioning Frequency

103. Frequency of repositioning will be influenced by variables concerning the individual (Strength of Evidence = C) and the support surface in use. (Strength of Evidence = A)

103.1 Repositioning frequency will be determined by the individual's tissue tolerance, their level of activity and mobility, their general medical condition, the overall treatment objectives, assessments of the individual's skin condition, and the type of support surface in use. Individuals should be turned every two hours until a personalized schedule is established. (Strength of Evidence = C)

Individuals who have developed a pressure ulcer and are at risk for further skin breakdown should be turned minimally every two hours. An individualized turning schedule should be developed based on the above factors.

103.2 Inspect the skin for additional damage each time the individual is repositioned. (Strength of Evidence = C)

103.3. Do not turn the individual onto a body surface that is damaged or still reddened from a previous episode of pressure loading, especially if the area of redness does not blanch (i.e., Category/Stage I pressure ulcer). (Strength of Evidence = C)

Repositioning Technique

104. Repositioning contributes to the individual's comfort, dignity, and functional ability. (Strength of Evidence = C)

104.1. Use devices to enable the individual to assist or independently position, lift and transfer (example trapeze, bed rails). (WRHA Expert Opinion) (Strength of Evidence = C)

104.2. Do not use soakers or bed sheets to reposition or move individuals in bed. (WRHA Expert Opinion) (Strength of Evidence = C) Use friction reducing devices (e.g., slider sheets or tubes).

104.3. When the individual is positioned in the supine position, the head of the bed should be flat (Diagram A). (WRHA Expert Opinion) If it is necessary to raise the head of bed, limit it to no greater than 30 degrees (Diagram B) to minimize the risk of sliding and shear forces. (Strength of Evidence = C)

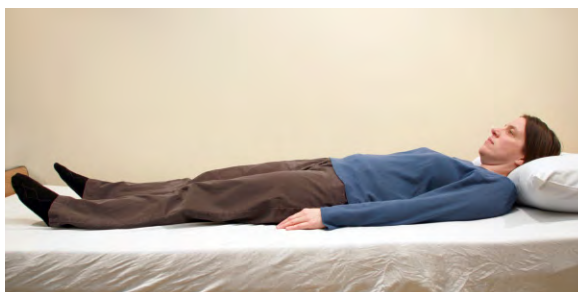


Diagram A Supine position



Diagram B Head of bed and knee gatch raised 30 °

104.4. Individuals positioned in the lateral side lying position should be positioned at no greater than 30 degrees. (Diagram C) (Strength of Evidence = C)

It is important to use pillows to keep bony prominences from contact with each other. A wedge cushion or pillow behind the back (above sacrum) will help the individual to maintain a 30° side lying position.

104.5 To avoid pressure on the trochanter, a 90 degree side lying position should not be used. (Strength of Evidence = C)

104.6. Sitting in bed should be avoided. Individuals should be positioned in a wheelchair or other suitable chair for meals and activities. (WRHA Expert Opinion) (Strength of Evidence = C)

If sitting in bed is necessary, the individual should be assisted to sit at the side of the bed with their feet supported on a foot stool if he/she has the balance and function to do so. If this is not possible, first raise the knee gatch to prevent sliding and then the head of the bed. (Australia Wound Management Association 2001. p. 24) Palpate the coccyx/sacrum once in this position to ensure the individual has not “bottomed out” on the support surface in use.

104.7 Do not use artificial sheepskin or ring- or donut-shaped devices for an individual with a pressure ulcer. (Strength of Evidence = C)

Once washed, artificial sheepskins become knotty and cause increased pressure. Ring or donut shaped devices can cause ischemia over the pressure area.

104.8 Do not apply heating devices (e.g., hot water bottles, heating pads, built-in bed warmers) directly on pressure ulcers. (Strength of Evidence = C)

Heat increases the metabolic rate, induces sweating, and decreases the tolerance of the tissue for pressure. When the body heat cannot dissipate, it will increase the risk of skin maceration and may impede healing.



Diagram C 30° Side lying position

Repositioning the Seated Individual

- 105. Only sit someone with a pressure ulcer if the pressure to the area can be offloaded or minimized in a seated position. Consult OT and/or PT to ensure that the proper equipment is in place and to make recommendations for the most effective position for offloading pressure to the ulcer. (Strength of Evidence = C)**

Consider positioning needs on all seating surfaces in addition to the wheelchair; eg. bath chair, commode, car seat, etc.

- 105.1 Ensure that the feet are properly supported either directly on the floor, on a foot stool or on foot rests when sitting in a bedside chair or wheelchair (Diagram D). (Strength of Evidence = C)**



Diagram D Seated Posture

- 105.2 Limit the amount of time that an individual spends seated in the chair without some form of pressure redistribution. (Strength of Evidence = C).**

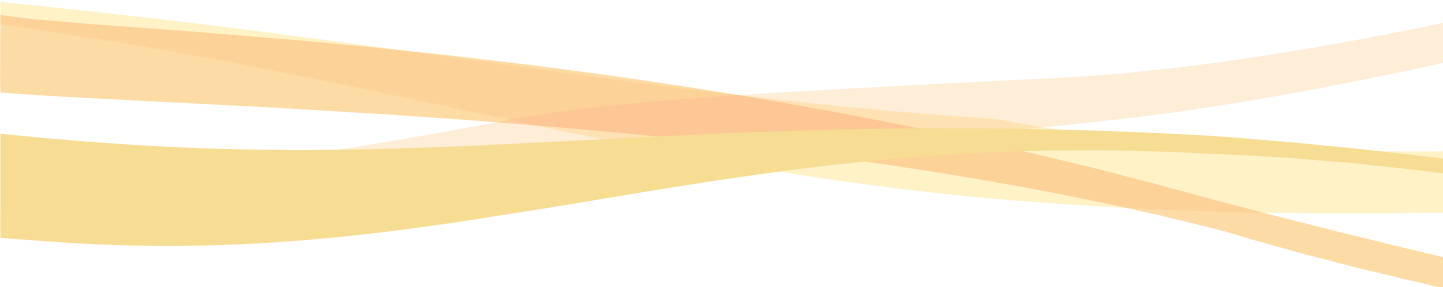
When an individual is seated correctly in a chair, the weight of the body still causes significant exposure to pressure over bony prominences (i.e. coccyx and ischial tuberosities) regardless of the support surface in use. As the loaded area in such cases is relatively small, the pressure has the potential to remain high. Therefore, without adequate pressure redistribution, a pressure ulcer can develop very quickly.

- 105.3 Individuals who are able to reposition themselves should be taught to reposition frequently, preferably every 15 minutes by using methods such as full or partial push-ups, forward lean or side to side lean. Ideally these positions should be held for 1-2 minutes. (WRHA Expert Opinion) (Strength of Evidence = C)**

When pressure is temporarily relieved, or redistributed on bony prominences, blood flow is restored and the risk of hypoxic damage reduced (RNAO, 2011). Reperfusion of the tissues can be achieved in 1-2 minutes (Sprigle, S. and Somenblum, S. (2011). If clients are not independent in repositioning, a caregiver should assist with repositioning. It is recommended this occur at least once every hour" (RNAO, 2011). The client may also benefit from a tilt wheelchair where they can be assisted to change their tilted position every 15 minutes.

- 105.4 Dynamic tilt or tilt used in combination with other dynamic wheelchair functions (such as recline) may be indicated for individuals who are unable to independently maintain or change their position. (WRHA Expert Opinion) (Strength of Evidence = C)**

Tilt or tilt with recline, if not used beyond a certain range can have little impact on pressure redistribution away from certain bony prominences. It has been shown that at least 30 degrees of tilt is required for substantive pressure reduction at the ischial tuberosities and the sacrum. Smaller angles of tilt may increase pressure on the sacrum. (Giesbrecht, Ethans and Staley, 2011). Recline, used alone, has major risks associated with shear. If either tilt or recline are indicated, the individual should be referred to OT/PT for a full seating assessment.



105.5 Individuals with pressure ulcers on the sacrum/coccyx or ischia, where pressure cannot be offloaded or minimized, should limit sitting. Sitting time should be determined based on an assessment of tissue tolerance. (Strength of Evidence = C)

Ideally, a thorough assessment of tissue tolerance involves a skin inspection before and after seating time to ensure there is no new nonblanchable reddened areas and is no increased tissue damage to the ulcer area. Initially limit seating time to 30-60 mins per day for meals. If there is no evidence of further tissue damage and the ulcer is showing signs of healing, the sitting time can be gradually increased.

105.6 Refer to OT and/or PT to reassess seating and positioning if the individual's ulcer worsens or fails to improve. (WRHA Expert Opinion) (Strength of Evidence = C)

SUPPORT SURFACES FOR TREATMENT OF PRESSURE ULCERS

This section addresses support surface recommendations for individuals with existing pressure ulcers. Refer to the Glossary for selected terms and definitions associated with support surfaces. Support surfaces alone neither prevent nor heal pressure ulcers. They are to be used as part of a total program of prevention and treatment. When pressure ulcers deteriorate or fail to heal, the professional should consider replacing the existing support surface with one that will improve pressure redistribution and microclimate (heat and moisture control) for the individual. Changing the support surface is only one of several strategies to consider. The individual and his/her pressure ulcer should be re-evaluated. Preventive interventions and local wound care should also be intensified as needed. A significant increase in risk status may also prompt re-evaluation of the individual and the support surface.

SLEEP AND SITTING SUPPORT SURFACES

General Recommendations

106. Ensure sleep and seating support surfaces are properly matched to the individual's needs for pressure redistribution, shear reduction, and microclimate control over a 24-hour period. (WRHA Expert Opinion)(Strength of Evidence = C)

106.1 Select a support surface that meets the individual's needs. Do not base the selection of a support surface solely on the perceived level of risk for pressure ulcer development or the category/stage of any existing pressure ulcers. (Strength of Evidence = C)

Consider the following factors:

- Number, severity, and location of the pressure ulcer(s)
- Risk for additional pressure ulcers
- Ability to carry out functional tasks
- Ability to provide care to the individual
- Ease in repositioning and transferring on and off support surface
- Comfort of the individual
- The individual's goals, values, and lifestyle
- The ability of the support surface to provide adequate pressure redistribution
- The ability of the support surface to dissipate heat and moisture (the more heat and moisture generated, the more at risk a person is for breakdown)
- The ability of the support surface to conform to body contours (envelopment)
- The level of immersion (depth of sinking into the surface)
- The number of available positions an individual can alternate between on a support surface (less available positions places an individual at higher risk for breakdown)
- The duration of time an individual can tolerate being in each position as determined by checking skin before and after each change in position

106.2 Ensure that the support surface is set up and used according to manufacturer's instructions. (WRHA Expert Opinion) (Strength of Evidence = C)

106.2.1 Verify that the support surface is being used within its functional life span, as indicated by the specific manufacturer's recommended test method (or other industry-recognized test method) before use of the support surface. (Strength of Evidence = C)

106.2.2 On every encounter, ensure that the support surface is working and that the client is not bottoming out by palpating areas correlating to the coccyx and sacral bony prominences. (Strength of Evidence = C)

Assess the individual's tissue tolerance to ensure that the support surface is providing adequate pressure redistribution.

106.2.3 If there are concerns that the support surface is not functioning properly or the client is bottoming out contact site equipment representative, supplier or the manufacturer to problem solve. (WRHA Expert Opinion) (Strength of Evidence = C)

Mattress and Bed Use

107. Use a mattress that minimizes peak pressures over bony prominences or intermittent removal of pressure. (WRHA Expert Opinion) (Strength of Evidence = C)

107.1 A higher-specification foam or similar non-powered pressure redistribution mattress is the minimum standard for individuals with pressure ulcers. (Strength of evidence = C)

107.2 Replace the existing mattress with an active support surface (see glossary) that provides improved pressure redistribution and shear reduction for the individual if the individual:

- Cannot be positioned off of the ulcer or
 - Has pressure ulcers on two or more turning surfaces (e.g., the sacrum and trochanter), thus limiting turning options or
 - Fails to heal or demonstrates ulcer deterioration despite appropriate comprehensive care or
 - Is at high risk for additional ulcers or
 - "Bottoms out" on the existing support surface
- (Strength of Evidence = C)

107.3 Consider the use of low-air-loss or air fluidized beds when the individual has any of the features in 107.2 and:

- is not showing signs of healing after 2 weeks or
 - has excessive skin moisture and/or elevated skin temperature in addition to other pressure ulcer risk factors
- (WRHA Expert Opinion) (Strength of Evidence = C)

107.4 Do not use small-cell alternating-pressure air mattresses or overlays. (Strength of Evidence = C)

Alternating-pressure air mattresses with small air cells (diameter <10 cm) cannot be sufficiently inflated to ensure pressure relief over the deflated air cells.

107.5 Choose a support surface that is compatible with the care setting. (Strength of Evidence = C)

Not all support surfaces are compatible with every care setting. Support surface use in a home setting requires consideration of:

- the weight of the bed frame
- the structure of the home, e.g. the width of doors, the availability of uninterrupted electrical power
- the ability to ventilate the heat from the mattress motor

107.6 Identify and prevent potential complications of support surface use. (WRHA Expert Opinion) (Strength of Evidence = C).

Possible complications include:

- Overlays placed on top of existing mattresses can elevate the surface nearer to the level of bed rails. The top to the bed rail should be more than 220mm (8.66 inches) above the mattress (European Standard EN60601-2-38).
- Issues of entrapment if the surface is not the same dimensions as the original mattress. Risks increase if the mattress edges compress and bed rails are in use (Health Canada, 2008).
- High beds may be difficult to transfer in and out of, increasing the risk of falling.
- Active surfaces may be less stable than reactive support surfaces which may compromise the individual's ability to reposition or transfer in and out independently.
- Some active surfaces may be "firmed up" in order to facilitate bed mobility, transfers, and some nursing care. The original bed settings need to be resumed immediately after these activities are completed.
- Individuals on surfaces with high immersion properties are at risk of developing hip contractures and Achilles tendon shortening; proper positioning and splinting can mitigate these risks.
- Mattresses that produce air flow at the skin interface can accelerate the evaporation of perspiration and can in some cases lead to dehydration. This should be considered in daily fluid intake and output (Australian Wound Management Association 2001).
- Mattresses that lead to a sensation of floating may lead to disorientation and confusion; in such cases, reorientation and explanations of the bed's function may be helpful.
- Powered support surfaces can have motion, can be noisy and may generate heat.
- Some mattresses may bottom out when certain positions are assumed; e.g. head of bed elevated. (WRHA Expert Opinion)

107.7 Choose positioning devices and incontinence pads that are compatible with the support surface. (Strength of Evidence = C)

Plastic-backed linens, pads and dressings will block the airflow and may potentially trap heat and moisture against the patient's skin. If plastic-backed incontinence products must be used, allow product to remain open or place them loosely against the skin to promote as much air flow as possible.

107.8 Limit the amount of linen and pads placed on the bed. (Strength of Evidence = C)

A general rule of thumb is "less is best" when selecting linens and incontinence pads to place on support surfaces to ensure that the functionality of the support surface is optimized. Apply linen according to manufacturer's recommendations. If fitted sheets are used, ensure they are loose so as to avoid a hammock effect.

Wheelchair and Other Sitting Support Surfaces

108. Seating components (backrest and cushion) must minimize or offload pressure to the pressure ulcer area. (Strength of Evidence = C)

108.1 Consult OT and/or PT to assess the individual and recommend an appropriate wheelchair and seating components (cushion and backrest). (WRHA Expert Opinion) (Strength of Evidence = C)

Choosing an appropriate wheelchair support surface is a complex process. The seating components need to address a number of performance goals in addition to pressure redistribution (i.e. postural support, ability to propel the wheelchair, transfers and positioning for functional activity). It is critical that the therapist prescribing seating components for individuals with neuromusculoskeletal conditions have expertise in the area.

108.1.1. Determine the effects of postural stability and asymmetries on pressure distribution by completing a comprehensive seating assessment. (WRHA Expert Opinion) (Strength of Evidence = C)

Assessment parameters should include:

- baseline sitting evaluation
- supine assessment
- sitting evaluation in simulated supported postures
- body measurements
- skin inspection
- pressure mapping or other tools to evaluate interface pressures (Hastings, 2000)
- seating equipment trials based on assessment results

108.2. Determine the exact location of the pressure ulcer before making a cushion or backrest recommendation. (WRHA Expert Opinion) (Strength of Evidence = C)

Evaluate the individual's tissue tolerance and interface pressures through palpation and visual inspection of the ulcer on specific support surfaces. Pressure mapping is an additional tool that can be used to supplement information gathered during this evaluation.

108.3 Seat individuals with ischial ulcers on a seating support surface that provides contour, uniform pressure distribution, and high immersion or offloading. (WRHA Expert Opinion) (Strength of Evidence = C)

108.4 Selection of cushions and cushion covers need to take into account the following factors: microclimate, amount of stretch, ease of transfers and repositioning, and ease of cleaning (WRHA Expert Opinion). (Strength of Evidence = C)

108.5. Inspect and maintain all aspects of the wheelchair seating components at appropriate regular intervals to ensure proper functioning and that the individual's needs are met. (WRHA Expert Opinion) (Strength of Evidence = C)

108.6 Assigned wheelchairs and seating components, including cushions, are not to be interchanged between individuals (WRHA Expert Opinion). (Strength of Evidence = C)

108.7 Request OT and/or PT to re-evaluate the seating components if the ulcers are not improving. (WRHA Expert Opinion) (Strength of Evidence = C)

If commercially available support surfaces have been tried and sacral/coccygeal or ischial ulcers fail to improve, the therapist should consult a seating specialist who can provide recommendations for alternative solutions (eg. custom offloading cushion).

108.8 Consideration of a pressure-redistributing surface should also be given to other seated surfaces. This includes, but is not limited to, toilet seats, bath seats, car seats, etc. (WRHA Expert Opinion) (Strength of Evidence = C)

Assessment of alternate sitting surfaces should be completed with those who have pressure ulcers on the sacral, coccyx and ischial areas. Individuals who spend an increased amount of time seated on alternate seated surfaces should be referred to OT and/or PT as padding for these surfaces will need to be considered.

108.9 Provide complete and accurate training to individuals and their caregivers, on the use and maintenance of wheelchair and seating component devices that have been fitted for the individual. (WRHA Expert Opinion) (Strength of Evidence = C)

Support Surfaces to treat Heel Ulcers

109. Ensure that the heels are free of the surface of the bed for individuals at high risk of developing heel pressure ulcers. (Strength of Evidence = C)

Integrated heel slopes in mattresses are often not sufficient to offload heels and thus a positioning device independent of the support surface in use is required.

109.1. Completely offload the heels by placing a pillow under the calves to “float the heels” off of the bed. (Strength of Evidence = B)

Use a pillow under the full length of the lower leg and calf to avoid areas of high pressure, particularly under the Achilles tendon. Flex the knee slightly to avoid popliteal vein compression and increased risk of deep vein thrombosis. Pillows are appropriate for short term use in alert and cooperative individuals.

109.2 If pillows are not effective in offloading heels, heel-protection devices can be considered. They should elevate the heel completely (offload them) in such a way as to distribute the weight of the leg along the calf without putting pressure on the Achilles tendon. The knee should be in slight flexion. (Strength of Evidence = C)

Hyperextension of the knee may cause obstruction of the popliteal vein, and this could predispose an individual to deep vein thrombosis. It is important to consult a clinician with expertise in using heel offloading devices as inappropriate selection or application can put the individual at risk of developing pressure ulcers on other areas of the foot or leg. Once a device is applied it is important to check for proper foot position on a regular basis and conduct a thorough skin assessment if any issues with positioning are found.

109.3. Apply the heel device according to manufacturer's instructions. (Strength of Evidence = C)

109.4. Ensure that the heel device is not too tight and does not create additional pressure. Check device placement more frequently in individuals with neuropathy, peripheral arterial disease, lower-extremity edema, or who are likely to develop edema. (Strength of Evidence = C)

109.5. Remove the heel device regularly to inspect the skin. (Strength of Evidence = C)
Inspect the skin every 8 hours or more frequently as needed.

SPECIAL POPULATIONS

Critically Ill Individuals

110. Consider the need to change support surfaces for individuals with poor local and systemic oxygenation and perfusion to improve pressure redistribution, reduce shear, control microclimate and utilize additional features (e.g., turn assistance, percussion) as needed. (Strength of Evidence = C)

111. Consider the need to change support surfaces for individuals who cannot be turned for medical reasons such as spinal instability and hemodynamic instability. Resume routine repositioning as soon as these conditions stabilize. (Strength of Evidence = C)

112. Consider slow, gradual turns allowing sufficient time for stabilization of hemodynamic and oxygenation status. (Strength of Evidence = C)

Some individuals are truly too unstable to turn. However, turning the individual more slowly or in small increments that allow adequate time for stabilization of vital signs should be considered when possible.

113. Consider more frequent small shifts in position to allow some reperfusion in individuals who cannot tolerate frequent major shifts in body position. Small shifts do not replace support-surface changes when needed or turning (major shifts in body position) when possible. (Strength of Evidence = C)

114. Prevent shear injury when lateral-rotation features are used. Assess skin frequently for shear injury. (Strength of Evidence = C)

114.1. Consider alternative methods, other than lateral rotation, of pressure redistribution in individuals with sacral or buttock pressure ulcers. (Strength of Evidence = C)

114.2. Offload the pressure ulcer(s) in individuals undergoing lateral-rotation therapy. (Strength of Evidence = C)

114.3. Inspect the pressure ulcer and the peri-ulcer skin for shear injury with every dressing change. Shear injury may appear as deterioration of the ulcer edge, undermining, and/or as increasing inflammation of peri-ulcer skin or the ulcer. (Strength of Evidence = C)

Continued use of lateral rotation may be necessary for individuals in respiratory distress. In all cases, the risks and benefits of continued lateral rotation should be weighed in individuals with existing pressure ulcers.

Individuals with Neurological Conditions

Individuals with neurological conditions such as spinal cord injuries, multiple sclerosis, amyotrophic lateral sclerosis require the use of a wheelchair. Consequences of these conditions such as spasticity, decreased/lack of sensation, muscle atrophy, and decreased proprioception need special consideration when determining which type of chair and seating components would best meet the individual's needs. Maintaining the ability to sit in their wheelchair, despite the presence of a pressure ulcer on a sitting surface, would be a high priority to allow the individual to continue to participate in daily activities.

In addition to the following recommendation, all general treatment recommendations should be followed.

115. Consult a therapist who has expertise in treating individuals with neurological conditions for a comprehensive seating assessment and evaluation of all positioning and support surfaces required over a 24-hour period. (WRHA Expert Opinion) (Strength of Evidence = C).

In order to facilitate sitting, without causing further damage to an individual's pressure ulcer(s), alternative solutions, such as customized off-loading cushions or alternating pressure seating devices should be considered.

BIOPHYSICAL AGENTS IN PRESSURE ULCER MANAGEMENT

(See “Care of the Wound Bed” for other recommendations for wound care. The treatments discussed in this section have been studied specifically in individuals with pressure ulcers)

Several forms of energy have been studied in the management of pressure ulcers. These include acoustic, mechanical, and kinetic energy as well as energy from the electromagnetic spectrum (EMS). Infrared (thermal) radiation, ultraviolet light (invisible light), and laser (coherent and monochromatic light) are all part of the EMS, as is electrical/electromagnetic stimulation. Biophysical agents can be used to deliver specific treatment substances to the wound bed.

All of these biophysical energies should be delivered using government-agency-approved medical devices as appropriate to the individual's health and wound condition. Use of biophysical agents should be directed by and under the supervision/management of a skilled licensed professional who has been educated and trained in safe and effective methods of choosing the appropriate patient candidate and the method of application and monitoring the positive and untoward effects. Refer to the EPUAP/NPUAP Clinical Practice Guideline for additional clinical guidance and a discussion of supporting research.

Electrical Stimulation

116. Consider the use of direct current (capacitative) electrical stimulation (ES) in the management of recalcitrant Category/Stage II, as well as Category/Stage III and IV pressure ulcers to facilitate wound healing. (Strength of Evidence = A)

Electromagnetic Agents

117. Consider the use of pulsed electromagnetic field (PEMF) treatment for recalcitrant Category/Stage II, III, and IV pressure ulcers. (Strength of Evidence = C)

PHOTOTHERAPY (LASER, INFRARED, ULTRAVIOLET)

Ultraviolet Light Therapy

118. Consider a short-term application of ultraviolet light C (UVC) if traditional therapies fail. (Strength of Evidence = C)

This recommendation is based primarily on expert opinion. Evidence is inconclusive.

119. Consider a course of ultraviolet light as an adjunctive therapy to reduce bacterial burden in clean, but critically colonized Category/Stage II and IV pressure ulcers. (Strength of Evidence = C)

This recommendation is based primarily on expert opinion. Evidence is inconclusive.

Ultraviolet light may be considered as an adjunctive therapy; but should not be used instead of other recommended therapies to reduce bacterial burden (see infection section).

Acoustic Energy (Ultrasound)

- 120. Consider use of non-contact low-frequency (40 kHz) ultrasound spray (NC-LFUS) for treatment of clean recalcitrant Category/Stage III and IV pressure ulcers. (Strength of Evidence = C)**

This recommendation is based primarily on expert opinion. There are no studies in pressure ulcers. Studies on other types of chronic wounds report mixed results and some adverse effects.

- 121. Consider use of low-frequency (22.5, 25, 35 kHz) ultrasound for debridement of necrotic soft tissue (not eschar). (Strength of Evidence = C)**

This recommendation is based on expert opinion.

- 122. Consider use of high-frequency (MHz) ultrasound as an adjunct for the treatment of infected pressure ulcers. (Strength of Evidence = C)**

This recommendation is based primarily on expert opinion. Evidence is inconclusive. High frequency ultrasound may be considered as an adjunctive therapy and should not be used instead of other recommended therapies to reduce bacterial burden (see Infection section).

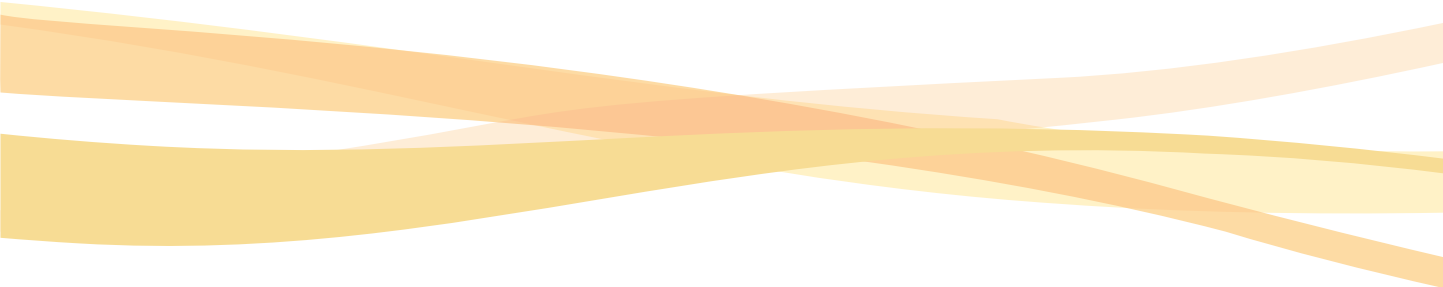
Negative Pressure Wound Therapy (NPWT)

- 123. Consider NPWT as an early adjuvant for the treatment of deep, Category/Stage III and IV pressure ulcers. (Strength of Evidence = B)**
- 124. Debride the pressure ulcer of necrotic tissue prior to the use of NPWT. (Strength of Evidence = C)**
- 125. Follow safe regimen in applying and removing the NPWT system. (System of Evidence = C)**
- 126. Evaluate the pressure ulcer with each dressing change. (Strength of Evidence = C)**
- 127. If pain is anticipated or reported, consider placing a non-adherent interface dressing on the wound bed, lowering the level of pressure, and/or changing the type of pressure (continuous or intermittent). (Strength of Evidence = C)**
- 128. Educate the individual and his/her family about NPWT when used in the home setting. (Strength of Evidence = C)**

HYDROTHERAPY

Whirlpool

- 129. Consider a course of whirlpool as an adjunct for wound cleansing and facilitating healing. (Strength of Evidence = C)**
- 130. Consider a course of whirlpool for reducing wound bioburden and infection. (Strength of Evidence = C)**



Pulsatile Lavage with Suction

- 131. Consider a course of pulsatile lavage with suction for wound cleansing and debridement). (Strength of Evidence = C)**

This recommendation is based primarily on expert opinion.

GROWTH FACTORS FOR PRESSURE ULCER TREATMENT

- 132. The combined clinical evidence on platelet-derived growth factor (PDGF) suggests the PDGF-BB may improve healing of pressure ulcers. However, the evidence is not sufficient to recommend this treatment for routine use. (Strength of Evidence = B)**

SURGERY FOR PRESSURE ULCERS

These recommendations focus on the care of the individual preoperatively, intraoperatively, and postoperatively. They do not focus on specific surgical techniques; those decisions are better left to an experienced surgeon who has an understanding of the unique needs of the patient. Randomized clinical trials in operative repair of pressure ulcers are almost non-existent in the literature.

Preoperative Recommendations

- 133. Evaluate the need for surgical consultation for operative repair for individuals with Category/Stage III or IV pressure ulcers that are not closing with conservative treatment, where all causative factors have been addressed as best as possible and/ or for individuals who desire more rapid closure of the ulcer. (Strength of Evidence = C)**

Individuals with medical conditions that would be worsened by the procedure; i.e. general anesthesia, blood loss, systemic stress, or immobility following surgery are usually not candidates for repair.

- 134. Obtain a surgical consultation for possible urgent drainage and/or debridement if the pressure ulcer has large amounts of necrotic tissue, advancing cellulitis or is a suspected source of sepsis. (Strength of Evidence = C)**

- 135. Prior to surgery, optimize physical factors that may impair surgical wound healing. (Strength of Evidence = C)**

Nutritional status must be adequate; vitamin and mineral deficiencies should be corrected. Optimize blood glucose levels. A diverting colostomy may be considered if bowel hygiene cannot be managed. Spasms need to be well controlled to avoid disrupting suture lines. If feasible, reduce dosages of drugs known to impede wound healing such as corticosteroids, chemotherapy, and immunosuppressive drugs. Nicotine must be stopped before surgery and at least 4 weeks postop.

- 136. Prior to surgery, optimize psychosocial factors that often impair surgical wound healing. (Strength of Evidence = B)**

137. **Assess for osteomyelitis; if present, infected bone must be resected prior to or during surgical closure. (Strength of Evidence = B)**

Plain film Xray or CT scan are used to assess for osteomyelitis in the majority of cases.

138. **Arrange for a support surface that provides intensive pressure redistribution and micro-climate control and assess the individual's tolerance of the support surface one to two days before surgery. (WRHA Expert Opinion) (Strength of Evidence = C)**

Intraoperative Recommendations

139. **Position the individual on the operating table with careful attention to protecting pressure points and the airway. (Strength of Evidence = C)**
140. **Excise the ulcer (including abnormal skin, necrotic tissue, sinus tracts, bursa and any infected bone) to the largest extent possible at the time of surgical closure. (Strength of Evidence = C)**
141. **Design flaps with composite tissues to improve durability. When possible, choose a flap that will not violate adjacent flap territories so as to preserve all future options for flap coverage. (Strength of Evidence = C)**
142. **Use a flap that is as large as possible, placing the suture line away from any areas of direct pressure. Minimize tension on the incisions at the time of closure. Consider possible functional loss and rehabilitation needs, especially in ambulatory individuals. (Strength of Evidence = C)**
143. **Transfer the individual with adequate help from the operating table onto the bed to avoid flap disruption. (Strength of Evidence = C)**

Postoperative Recommendations

144. **Maintain the individual on an intensive pressure-redistribution system that reduces shear and pressure on the operative site, limits tension on the incision(s), and controls local microclimate. Do not elevate the head of the bed or move the person from the bed without explicit approval from the surgeon. (Strength of Evidence = C)**

Air fluidized beds have been commonly used for pressure redistribution and shear reduction after surgical repair. Time spent on surfaces that lack adequate pressure redistribution, i.e. gurneys, stretchers and x-ray tables, should be avoided or severely limited.

145. **Protect the blood supply to the flap from pressure and pulling. (Strength of Evidence = C)**

An example of an activity that can diminish blood flow is the use of a bed pan and thus should be avoided for individuals who have flaps to the pelvis. These individuals should defecate on a bed pad.

146. **Report signs of flap failure to the surgeon immediately. (Strength of Evidence = C)**

Suture line dehiscence is the most common single early post-operative complication.

147. Monitor drainage from wound drains making certain that drainage tubes are not kinked or clogged. (Strength of Evidence = C)

148. Prevent hazards of immobility. (Strength of Evidence = C)

149. Turn the individual regularly with a turning sheet to prevent new pressure ulcers, regardless of the support surface in use. (Strength of Evidence = C)

A turning schedule should be determined based on the individual's tissue response.

150. Initiate a program of progressive sitting according to the surgeon's orders. (Strength of Evidence = C)

When weight bearing on the operative site is allowed to start, weight bearing should be graduated and progressive based on careful assessment of the tissue tolerance. Sitting can be increased in time if no erythema is noted over weight-bearing areas. Tissue tolerance to pressure over the wound site should be assessed after each period of sitting.

151. Position the individual only in an appropriate pressure-redistributing seating system (chair and cushion) when he/she is sitting (Strength of Evidence = C)

See information in the Support Surfaces for Treatment of Pressure Ulcers section on wheelchair selection.

152. Dress the individual in appropriate clothing to prevent injury to the flap when using slide boards. (Strength of Evidence = C)

Individuals should be adequately clothed to protect the skin during transfers; hospital gowns that are open in the back may permit skin drag on transfer devices or slide boards. Clothing with zippers, buttons, or snaps should not be used over the surgical site or pressure points.

153. Confirm the presence of an adequate social network at home prior to discharging the individual from a facility. (Strength of Evidence = B)

154. Confirm the individual's ability to obtain needed equipment, maintain the equipment, and adhere to postoperative needs after surgery. (Strength of Evidence = C)

APPENDIX B

BATES-JENSEN WOUND ASSESSMENT TOOL

Instructions for use

General Guidelines:

Fill out the attached rating sheet to assess a wound's status after reading the definitions and methods of assessment described below. Evaluate once a week and whenever a change occurs in the wound. Rate according to each item by picking the response that best describes the wound and entering that score in the item score column for the appropriate date. When you have rated the wound on all items, determine the total score by adding together the 13-item scores. The HIGHER the total score, the more severe the wound status. Plot total score on the Wound Status Continuum to determine progress.

Specific Instructions:

1. **Size:** Use ruler to measure the longest and widest aspect of the wound surface in centimeters; multiply length x width.

2. **Depth:** Pick the depth, thickness, most appropriate to the wound using these additional descriptions:
 - 1 = tissues damaged but no break in skin surface.
 - 2 = superficial, abrasion, blister or shallow crater. Even with, &/or elevated above skin surface (e.g., hyperplasia).
 - 3 = deep crater with or without undermining of adjacent tissue.
 - 4 = visualization of tissue layers not possible due to necrosis.
 - 5 = supporting structures include tendon, joint capsule.

3. **Edges:** Use this guide:

Indistinct, diffuse	=	unable to clearly distinguish wound outline.
Attached	=	even or flush with wound base, <u>no</u> sides or walls present; flat.
Not attached	=	sides or walls <u>are</u> present; floor or base of wound is deeper than edge.
Rolled under, thickened	=	soft to firm and flexible to touch.
Hyperkeratosis	=	callous-like tissue formation around wound & at edges.
Fibrotic, scarred	=	hard, rigid to touch.

4. **Undermining:** Assess by inserting a cotton tipped applicator under the wound edge; advance it as far as it will go without using undue force; raise the tip of the applicator so it may be seen or felt on the surface of the skin; mark the surface with a pen; measure the distance from the mark on the skin to the edge of the wound. Continue process around the wound. Then use a transparent metric measuring guide with concentric circles divided into 4 (25%) pie-shaped quadrants to help determine percent of wound involved.

5. **Necrotic Tissue Type:** Pick the type of necrotic tissue that is predominant in the wound according to color, consistency and adherence using this guide:

White/gray non-viable tissue	=	may appear prior to wound opening; skin surface is white or gray.
Non-adherent, yellow slough	=	thin, mucinous substance; scattered throughout wound bed; easily separated from wound tissue.
Loosely adherent, yellow slough	=	thick, stringy, clumps of debris; attached to wound tissue.
Adherent, soft, black eschar	=	soggy tissue; strongly attached to tissue in center or base of wound.
Firmly adherent, hard/black eschar	=	firm, crusty tissue; strongly attached to wound base <u>and</u> edges (like a hard scab).

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6. **Necrotic Tissue Amount:** Use a transparent metric measuring guide with concentric circles divided into 4 (25%) pie-shaped quadrants to help determine percent of wound involved.
7. **Exudate Type:** Some dressings interact with wound drainage to produce a gel or trap liquid. Before assessing exudate type, gently cleanse wound with normal saline or water. Pick the exudate type that is predominant in the wound according to color and consistency, using this guide:

Bloody	=	thin, bright red
Serosanguineous	=	thin, watery pale red to pink
Serous	=	thin, watery, clear
Purulent	=	thin or thick, opaque tan to yellow
Foul purulent	=	thick, opaque yellow to green with offensive odor
8. **Exudate Amount:** Use a transparent metric measuring guide with concentric circles divided into 4 (25%) pie-shaped quadrants to determine percent of dressing involved with exudate. Use this guide:

None	=	wound tissues dry.
Scant	=	wound tissues moist; no measurable exudate.
Small	=	wound tissues wet; moisture evenly distributed in wound; drainage involves $\leq 25\%$ dressing.
Moderate	=	wound tissues saturated; drainage may or may not be evenly distributed in wound; drainage involves $> 25\%$ to $\leq 75\%$ dressing.
Large	=	wound tissues bathed in fluid; drainage freely expressed; may or may not be evenly distributed in wound; drainage involves $> 75\%$ of dressing.
9. **Skin Color Surrounding Wound:** Assess tissues within 4cm of wound edge. Dark-skinned persons show the colors "bright red" and "dark red" as a deepening of normal ethnic skin color or a purple hue. As healing occurs in dark-skinned persons, the new skin is pink and may never darken.
10. **Peripheral Tissue Edema & Induration:** Assess tissues within 4cm of wound edge. Non-pitting edema appears as skin that is shiny and taut. Identify pitting edema by firmly pressing a finger down into the tissues and waiting for 5 seconds, on release of pressure, tissues fail to resume previous position and an indentation appears. Induration is abnormal firmness of tissues with margins. Assess by gently pinching the tissues. Induration results in an inability to pinch the tissues. Use a transparent metric measuring guide to determine how far edema or induration extends beyond wound.
11. **Granulation Tissue:** Granulation tissue is the growth of small blood vessels and connective tissue to fill in full thickness wounds. Tissue is healthy when bright, beefy red, shiny and granular with a velvety appearance. Poor vascular supply appears as pale pink or blanched to dull, dusky red color.
12. **Epithelialization:** Epithelialization is the process of epidermal resurfacing and appears as pink or red skin. In partial thickness wounds it can occur throughout the wound bed as well as from the wound edges. In full thickness wounds it occurs from the edges only. Use a transparent metric measuring guide with concentric circles divided into 4 (25%) pie-shaped quadrants to help determine percent of wound involved and to measure the distance the epithelial tissue extends into the wound.

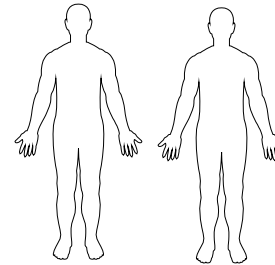
BATES-JENSEN WOUND ASSESSMENT TOOL

NAME _____

Complete the rating sheet to assess wound status. Evaluate each item by picking the response that best describes the wound and entering the score in the item score column for the appropriate date.

Location: Anatomic site. Circle, identify right (**R**) or left (**L**) and use "X" to mark site on body diagrams:

- | | |
|--------------------------|---------------------|
| _____ Sacrum & coccyx | _____ Lateral ankle |
| _____ Trochanter | _____ Medial ankle |
| _____ Ischial tuberosity | _____ Heel |
- Other Site _____



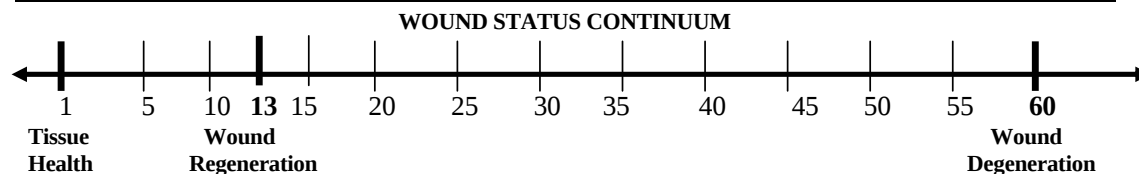
Shape: Overall wound pattern; assess by observing perimeter and depth.

Circle and date appropriate description:

- | | |
|------------------------|---------------------------|
| _____ Irregular | _____ Linear or elongated |
| _____ Round/oval | _____ Bowl/boat |
| _____ Square/rectangle | _____ Butterfly |
- Other Shape _____

Item	Assessment	Date Score	Date Score	Date Score
1. Size	1 = Length x width <4 sq cm 2 = Length x width 4--<16 sq cm 3 = Length x width 16.1--<36 sq cm 4 = Length x width 36.1--<80 sq cm 5 = Length x width >80 sq cm			
2. Depth	1 = Non-blanchable erythema on intact skin 2 = Partial thickness skin loss involving epidermis &/or dermis 3 = Full thickness skin loss involving damage or necrosis of subcutaneous tissue; may extend down to but not through underlying fascia; &/or mixed partial & full thickness &/or tissue layers obscured by granulation tissue 4 = Obscured by necrosis 5 = Full thickness skin loss with extensive destruction, tissue necrosis or damage to muscle, bone or supporting structures			
3. Edges	1 = Indistinct, diffuse, none clearly visible 2 = Distinct, outline clearly visible, attached, even with wound base 3 = Well-defined, not attached to wound base 4 = Well-defined, not attached to base, rolled under, thickened 5 = Well-defined, fibrotic, scarred or hyperkeratotic			
4. Undermining	1 = None present 2 = Undermining < 2 cm in any area 3 = Undermining 2-4 cm involving < 50% wound margins 4 = Undermining 2-4 cm involving > 50% wound margins 5 = Undermining > 4 cm or Tunneling in any area			
5. Necrotic Tissue Type	1 = None visible 2 = White/grey non-viable tissue &/or non-adherent yellow slough 3 = Loosely adherent yellow slough 4 = Adherent, soft, black eschar 5 = Firmly adherent, hard, black eschar			
6. Necrotic Tissue Amount	1 = None visible 2 = < 25% of wound bed covered 3 = 25% to 50% of wound covered 4 = > 50% and < 75% of wound covered 5 = 75% to 100% of wound covered			
7. Exudate Type	1 = None 2 = Bloody 3 = Serosanguineous: thin, watery, pale red/pink 4 = Serous: thin, watery, clear 5 = Purulent: thin or thick, opaque, tan/yellow, with or without odor			

Item	Assessment	Date Score	Date Score	Date Score
8. Exudate Amount	1 = None, dry wound 2 = Scant, wound moist but no observable exudate 3 = Small 4 = Moderate 5 = Large			
9. Skin Color Surrounding Wound	1 = Pink or normal for ethnic group 2 = Bright red &/or blanches to touch 3 = White or grey pallor or hypopigmented 4 = Dark red or purple &/or non-blanchable 5 = Black or hyperpigmented			
10. Peripheral Tissue Edema	1 = No swelling or edema 2 = Non-pitting edema extends <4 cm around wound 3 = Non-pitting edema extends $\geq$ 4 cm around wound 4 = Pitting edema extends < 4 cm around wound 5 = Crepitus and/or pitting edema extends $\geq$ 4 cm around wound			
11. Peripheral Tissue Induration	1 = None present 2 = Induration, < 2 cm around wound 3 = Induration 2-4 cm extending < 50% around wound 4 = Induration 2-4 cm extending $\geq$ 50% around wound 5 = Induration > 4 cm in any area around wound			
12. Granulation Tissue	1 = Skin intact or partial thickness wound 2 = Bright, beefy red; 75% to 100% of wound filled &/or tissue overgrowth 3 = Bright, beefy red; < 75% & > 25% of wound filled 4 = Pink, &/or dull, dusky red &/or fills $\leq$ 25% of wound 5 = No granulation tissue present			
13. Epithelialization	1 = 100% wound covered, surface intact 2 = 75% to <100% wound covered &/or epithelial tissue extends >0.5cm into wound bed 3 = 50% to <75% wound covered &/or epithelial tissue extends to <0.5cm into wound bed 4 = 25% to < 50% wound covered 5 = < 25% wound covered			
	TOTAL SCORE			
	SIGNATURE			



Plot the total score on the Wound Status Continuum by putting an "X" on the line and the date beneath the line. Plot multiple scores with their dates to see-at-a-glance regeneration or degeneration of the wound.

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Permission obtained from Barbara Bates-Jensen PhD, RN, FAAN to include this tool on May 14, 2012

REFERENCES

- Arledge, S., Armstrong, W., Babinec, M., Dicianno, B.E., Dgiovine, C., Dyson-Hudson, T., . . . Stogner, J. (2011). *RESNA wheelchair service provision guide*. Retrieved from <http://www.resna.org/dotAsset/22485.pdf>
- Australian Wound Management Association. (2001). *Clinical practice guidelines for the prediction and prevention of pressure ulcers*. West Leederville: Cambridge Publishing.
- Buss, I.C., Halfens, R.J.G., & Abu-Saad, H.H. (2002). The most effective time interval for repositioning subjects at risk of pressure sore development: A literature review. *Rehabilitation Nursing*, 27, 59-77. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1002/j.2048-7940.2002.tb01986.x/abstract>
- Consortium of Spinal Cord Reference. (2000). *Pressure ulcer prevention and treatment following spinal cord injury: A clinical practice guideline for health care professionals*. Washington, D.C.: Paralyzed Veterans of America.
- Dicianno, B. E., Arva, J., Lieberman, J. M., Schmeler, M. R., Souza, A., Phillips, K., ... & Betz, K. L. (2009). RESNA position on the application of tilt, recline, and elevating legrests for wheelchairs. *Assistive Technology*, 21(1), 13-22. Retrieved from http://www.resna.org/resources/position-papers/RESNA_Application_Tilt_Wheelchairs.pdf
- Giesbrecht, EM. (2003). *A therapist's guide to pressure ulcer prevention and management*. (2nd ed); Winnipeg, MB; Department of Occupational Therapy, Health Sciences Centre.
- Hastings, J. (2000). Seating assessment and planning. *Topics in Spinal Cord Injury Medicine*, 11(1), 183-207.
- Health Canada. (2008). *Adult hospital beds: Patient entrapment hazards, side rail latching reliability, and other hazards*. Ottawa: Minister of Public Works and Government Services.
- Health Sciences Centre (HSC) Department of Occupational Therapy. (2003) 2nd. Ed. *A Therapists guide to pressure ulcer prevention and management*. HSC.
- Keast, D. H. , Parslow, N., Houghton, P. E., Norton, L., & Fraser, C. (2006). *Best practice recommendations for the prevention and treatment of pressure ulcers*. Toronto: CAWC.
- Lachenbruch, C. (2005). Skin cooling surfaces: estimating the importance of limiting skin temperature. *Ostomy wound management*, 51(2), 70-79. Retrieved from <http://www.o-wm.com/content/skin-cooling-surfaces-estimating-importance-limiting-skin-temperature>
- Michael, S.M., Porter, D., & Pounteney, T.E. (2007). Tilted seat position for non-ambulant individuals with neurological and neuromuscular impairment: A systematic review. *Clinical Rehabilitation*, 21, 1063-1074. Retrieved from <http://cre.sagepub.com/content/21/12/1063.full.pdf+html>
- National Pressure Ulcer Advisory Panel (NPUAP) and European Pressure Ulcer Advisory Panel (EPUAP) (2009). *Pressure ulcer prevention and treatment: Clinical Practice guideline*. Washington DC: National Pressure Ulcer Advisory Panel.
- New South Wales Agency for Clinical Innovation (n.d.). *Spinal seating program: Module 8, pressure management*. Retrieved from http://www.aci.health.nsw.gov.au/networks/spinal-seating/8_pressure
- Norton, L., Coutts, P., & Sibbald, G. (2011). Beds: Practical pressure management for surfaces/mattresses. *Advances in Skin & Wound Care*, 24, 324-332. Retrieved from http://journals.lww.com/aswcjournal/Abstract/2011/07000/Beds_Practical_Pressure_Management_for9.aspx
- Norton, L., & Sibbald, R. G. (2004). Is bed rest an effective treatment modality for pressure ulcers?. *Ostomy Wound Management*, 50, 40-52. Retrieved from <http://www.o-wm.com/content/is-bed-rest-an-effective-treatment-modality-pressure-ulcers>

Pressure Ulcer Expert Working Group. (2010). Pressure ulcer prevention: *Pressure, shear, friction and microclimate in context*. A consensus document. London, Wounds International. Retrieved from http://www.woundsinternational.com/pdf/content__8925.pdf

Regan, M., Teasell, R.W., Keast, D.I., Aubut, J.L., Foulon, B.L., Mehta, S. (2010). Pressure Ulcers Following Spinal Cord Injury. Regan, M., Teasell, R. W., Keast, D., Aubut, J., Foulon, B.L. & Mehta, S. (2010). Pressure ulcers following spinal cord injury. Spinal Cord Injury Rehabilitation Evidence. JJ Eng, RW Teasell, WC Milleret al. Vancouver. Version 3.0. Retrieved from http://www.scireproject.com/sites/default/files/pressure_ulcers.pdf

RNAO. (2011). Nursing Best Practice Guideline: Assessment and Management of Stage I-IV Pressure Ulcers, Toronto: RNAO.

Sprigle, S., & Sonenblum, S. (2011). Assessing evidence supporting redistribution of pressure for pressure ulcer prevention: A review. *Journal of Rehabilitation Research & Development*, 48, 203-214. Retrieved from <http://www.rehab.research.va.gov/jour/11/483/page203.html>

Stockton, L., Gebhardt, K.S., and Clark, M. (2009). Seating and pressure ulcers: Clinical practice guideline. *Journal of Tissue Viability*, 18, 98-108.

Wound Care-Pressure Ulcers Practice Guidance Summary (2010). Retrieved June 21, 2010 from: <http://www.dieteticsatwork.com/Pen/KnowledgePathway.asp?kpid=7871&trid=7860&trcatid=43>