Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL GUIDELINE CLEARINGHOUSE

General

Guideline Title

Interventions for prevention and treatment of pressure ulcers. In: Prevention and treatment of pressure ulcers: clinical practice guideline.

Bibliographic Source(s)

National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, Pan Pacific Pressure Injury Alliance. Interventions for prevention and treatment of pressure ulcers. In: Prevention and treatment of pressure ulcers: clinical practice guideline. Washington (DC): National Pressure Ulcer Advisory Panel; 2014. p. 79-125. [212 references]

Guideline Status

This is the current release of the guideline.

This guideline updates previous versions: National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel. Pressure ulcer prevention recommendations. In: Prevention and treatment of pressure ulcers: clinical practice guideline. Washington (DC): National Pressure Ulcer Advisory Panel; 2009. p. 21-50. [214 references]

National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel. Pressure ulcer treatment recommendations. In: Prevention and treatment of pressure ulcers: clinical practice guideline. Washington (DC): National Pressure Ulcer Advisory Panel; 2009. p. 51-120. [432 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Recommendations

Major Recommendations

The strength of evidence ratings (A-C) and strength of recommendation grades (Strong positive recommendation, Weak positive recommendation, No specific recommendation, Weak negative recommendation, Strong negative recommendation) are defined at the end of the "Major Recommendations" field.

Note from the National Pressure Ulcer Advisory Panel (NPUAP), the European Pressure Ulcer Advisory Panel (EPUAP), Pan Pacific Pressure Injury Alliance (PPPIA) and the National Guideline Clearinghouse (NGC): The pressure ulcer clinical practice guideline has been divided into individual summaries covering prevention, interventions for prevention and treatment, treatment, and special populations. This summary should not be read in isolation but in conjunction with the other summaries. In addition to the current summary, the following are available:

- Prevention of pressure ulcers
- Treatment of pressure ulcers

- Special populations

Nutrition in Pressure Ulcer Prevention and Treatment

Nutrition Screening

1. Screen nutritional status for each individual at risk of or with a pressure ulcer:
    - At admission to a health care setting
    - With each significant change of clinical condition
    - When progress toward pressure ulcer closure is not observed. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
2. Use a valid and reliable nutrition screening tool to determine nutritional risk. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
3. Refer individuals screened to be at risk of malnutrition and individuals with an existing pressure ulcer to a registered dietitian or an interprofessional nutrition team for a comprehensive nutrition assessment. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

Nutrition Assessment

1. Assess the weight status of each individual to determine weight history and identify significant weight loss (≥5% in 30 days or ≥10% in 180 days). (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
2. Assess the individual's ability to eat independently. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
3. Assess the adequacy of total nutrient intake (i.e., food, fluid, oral supplements and enteral/parenteral feeds). (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

Care Planning

1. Develop an individualized nutrition care plan for individuals with or at risk of a pressure ulcer. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
2. Follow relevant and evidence-based guidelines on nutrition and hydration for individuals who exhibit nutritional risk and who are at risk of pressure ulcers or have an existing pressure ulcer. (Strength of Evidence=C; Strength of Recommendation = Weak positive recommendation)

Energy Intake

1. Provide individualized energy intake based on underlying medical condition and level of activity. (Strength of Evidence = B; Strength of Recommendation = Weak positive recommendation)
2. Provide 30 to 35 kcalories/kg body weight for adults at risk of a pressure ulcer who are assessed as being at risk of malnutrition. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
3. Provide 30 to 35 kcalories/kg body weight for adults with a pressure ulcer who are assessed as being at risk of malnutrition. (Strength of Evidence = B; Strength of Recommendation = Weak positive recommendation)
4. Adjust energy intake based on weight change or level of obesity. Adults who are underweight or who have had significant unintended weight loss may need additional energy intake. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
5. Revise and modify/liberalize dietary restrictions when limitations result in decreased food and fluid intake. These adjustments should be made in consultation with a medical professional and managed by a registered dietitian whenever possible. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
6. Offer fortified foods and/or high calorie, high protein oral nutritional supplements between meals if nutritional requirements cannot be achieved by dietary intake. (Strength of Evidence = B; Strength of Recommendation = Strong positive recommendation)
7. Consider enteral or parenteral nutritional support when oral intake is inadequate. This must be consistent with the individual's goals. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

Protein Intake

1. Provide adequate protein for positive nitrogen balance for adults assessed to be at risk of a pressure ulcer. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
2. Offer 1.25 to 1.5 grams protein/kg body weight daily for adults at risk of a pressure ulcer who are assessed to be at risk of malnutrition when compatible with goals of care, and reassess as condition changes. (Strength of Evidence = C; Strength of Recommendation = Weak

positive recommendation)

3. Provide adequate protein for positive nitrogen balance for adults with a pressure ulcer. (Strength of Evidence = B; Strength of Recommendation = Weak positive recommendation)
4. Offer 1.25 to 1.5 grams protein/kg body weight daily for adults with an existing pressure ulcer who are assessed to be at risk of malnutrition when compatible with goals of care, and reassess as condition changes. (Strength of Evidence = B; Strength of Recommendation = Weak positive recommendation)
5. Offer high calorie, high protein nutritional supplements in addition to the usual diet to adults with nutritional risk and pressure ulcer risk, if nutritional requirements cannot be achieved by dietary intake. (Strength of Evidence = A; Strength of Recommendation = Weak positive recommendation)
6. Assess renal function to ensure that high levels of protein are appropriate for the individual. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
7. Supplement with high protein, arginine and micronutrients for adults with a pressure ulcer Category/Stage III or IV or multiple pressure ulcers when nutritional requirements cannot be met with traditional high calorie and protein supplements. (Strength of Evidence = B; Strength of Recommendation = Weak positive recommendation)

Hydration

1. Provide and encourage adequate daily fluid intake for hydration for an individual assessed to be at risk of or with a pressure ulcer. This must be consistent with the individual's comorbid conditions and goals. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
2. Monitor individuals for signs and symptoms of dehydration including change in weight, skin turgor, urine output, elevated serum sodium, and/or calculated serum osmolality. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
3. Provide additional fluid for individuals with dehydration, elevated temperature, vomiting, profuse sweating, diarrhea, or heavily exuding wounds. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

Vitamins and Minerals

1. Provide/encourage individuals assessed to be at risk of pressure ulcers to consume a balanced diet that includes good sources of vitamins and minerals. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
2. Provide/encourage an individual assessed to be at risk of a pressure ulcer to take vitamin and mineral supplements when dietary intake is poor or deficiencies are confirmed or suspected. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
3. Provide/encourage an individual with a pressure ulcer to consume a balanced diet that includes good sources of vitamins and minerals. (Strength of Evidence = B; Strength of Recommendation = Strong positive recommendation)
4. Provide/encourage an individual with a pressure ulcer to take vitamin and mineral supplements when dietary intake is poor or deficiencies are confirmed or suspected. (Strength of Evidence = B; Strength of Recommendation = Weak positive recommendation)

<u>Repositioning and Early Mobilization</u>

General Repositioning for All Individuals

1. Reposition all individuals at risk of, or with existing pressure ulcers, unless contraindicated. (Strength of Evidence = A; Strength of Recommendation = Strong positive recommendation)
2. Consider the condition of the individual and the pressure redistribution support surface in use when deciding if repositioning should be implemented as a prevention strategy. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

Repositioning Frequency

1. Consider the pressure redistribution support surface in use when determining the frequency of repositioning. (Strength of Evidence = A; Strength of Recommendation = Weak positive recommendation)
2. Determine repositioning frequency with consideration to the individual's:
    - Tissue tolerance
    - Level of activity and mobility
    - General medical condition
    - Overall treatment objectives
    - Skin condition
    - Comfort (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

3. Establish pressure relief schedules that prescribe the frequency and duration of weight shifts. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
   3.1. Teach individuals to do "pressure relief lifts" or other pressure relieving maneuvers as appropriate. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

4. Regularly assess the individual's skin condition and general comfort. Reconsider the frequency and method of repositioning if the individual is not responding as expected to the repositioning regime. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

Repositioning Techniques

1. Reposition the individual in such a way that pressure is relieved or redistributed. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
2. Avoid positioning the individual on bony prominences with existing non-blanchable erythema. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
3. Avoid subjecting the skin to pressure and shear forces. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
   3.1. Use manual handling aids to reduce friction and shear. Lift — don't drag — the individual while repositioning. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

   3.2. Use a split leg sling mechanical lift when available to transfer an individual into a wheelchair or bedside chair when the individual needs total assistance to transfer. Remove the sling immediately after transfer. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

   3.3. Do not leave moving and handling equipment under the individual after use, unless the equipment is specifically designed for this purpose. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

4. Avoid positioning the individual directly onto medical devices, such as tubes, drainage systems or other foreign objects. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
5. Do not leave the individual on a bedpan longer than necessary. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

Repositioning Individuals in Bed

1. Use the 30° tilted side-lying position (alternately, right side, back, left side) or the prone position if the individual can tolerate this and her/his medical condition allows. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
   1.1. Encourage individuals who can reposition themselves to sleep in a 30° to 40° side-lying position or flat in bed if not contraindicated. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

   1.2. Avoid lying postures that increase pressure, such as the 90° side-lying position, or the semi-recumbent position. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

2. Limit head-of-bed elevation to 30° for an individual on bedrest unless contraindicated by medical condition or feeding and digestive considerations. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
   2.1. If sitting in bed is necessary, avoid head-of-bed elevation or a slouched position that places pressure and shear on the sacrum and coccyx. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

Prone Position

1. Use a pressure redistribution surface to offload pressure points on the face and body while in the prone position. (Strength of evidence = C; Strength of Recommendation = Weak positive recommendation)
2. At each rotation, assess other body areas (i.e., breast region, knees, toes, penis, clavicles, iliac crest, symphysis pubis) that may be at risk when individuals are in the prone position. (Strength of evidence = C; Strength of Recommendation = Weak positive recommendation)
3. At each rotation, assess individuals placed in the prone position for evidence of facial pressure ulcers. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

Repositioning Seated Individuals

1. Position the individual so as to maintain stability and his or her full range of activities. (Strength of Evidence = C; Strength of

Recommendation = Strong positive recommendation)

2. Select a seated posture that is acceptable for the individual and minimizes the pressures and shear exerted on the skin and soft tissues. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
   2.1. Provide adequate seat tilt to prevent sliding forward in the wheelchair or chair, and adjust footrests and armrests to maintain proper posture and pressure redistribution. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

3. Ensure that the feet are properly supported either directly on the floor, on a footstool, or on footrests when sitting (upright) in a bedside chair or wheelchair. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
   3.1. Avoid the use of elevating leg rests if the individual has inadequate hamstring length. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

4. Limit the time an individual spends seated in a chair without pressure relief. (Strength of Evidence = B; Strength of Recommendation = Strong positive recommendation)

Additional Recommendations for Individuals with Existing Pressure Ulcers

1. Do not position an individual directly on a pressure ulcer. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
   1.1. Position the individual off area(s) of suspected deep tissue injury with intact skin. If pressure over the area cannot be relieved by repositioning, select an appropriate support surface. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

2. Continue to turn and reposition the individual regardless of the support surface in use. Establish turning frequency based on the characteristics of the support surface and the individual's response. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
3. Inspect the skin for additional damage each time the individual is turned or repositioned. 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; Strength of Recommendation = Strong positive recommendation)

Repositioning the Individual with Existing Pressure Ulcers in a Chair

1. Minimize seating time and consult a seating specialist if pressure ulcers worsen on the seating surface selected. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
2. Consider periods of bed rest to promote ischial and sacral ulcer healing. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
   2.1. Weigh the risks and benefits of supported sitting against benefits to both physical and emotional health. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

3. If sitting in a chair is necessary for individuals with pressure ulcers on the sacrum/coccyx or ischia, limit sitting to three times a day in periods of 60 minutes or less. Consult a seating specialist to prescribe an appropriate seating surface and/or positioning techniques to avoid or minimize pressure on the ulcer. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
4. Avoid seating an individual with an ischial ulcer in a fully erect posture (in chair or bed). (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
5. Modify sitting time schedules and re-evaluate the seating surface and the individual's posture if the ulcer worsens or fails to improve. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

Positioning Devices

1. Do not use ring or donut-shaped devices. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
2. The following "devices" should not be used to elevate heels:
   - Synthetic sheepskin pads
   - Cutout, ring, or donut-type devices
   - Intravenous fluid bags
   - Water-filled gloves (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
3. Natural sheepskin pads might assist in preventing pressure ulcers. (Strength of Evidence = B; Strength of Recommendation = Weak positive recommendation)

Mobilization

1. Develop a schedule for progressive sitting according to the individual's tolerance and pressure ulcer response. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
2. Increase activity as rapidly as tolerated. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

Repositioning Documentation

1. Record repositioning regimes, specifying frequency and position adopted, and include an evaluation of the outcome of the repositioning regime. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

Repositioning to Prevent and Treat Heel Pressure Ulcers

General Recommendations

1. Inspect the skin of the heels regularly. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

Repositioning for Preventing Heel Pressure Ulcers

1. Ensure that the heels are free of the surface of the bed. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
   1.1. Use heel suspension devices that elevate and offload the heel completely in such a way as to distribute the weight of the leg along the calf without placing pressure on the Achilles tendon. (Strength of Evidence = B; Strength of Recommendation = Strong positive recommendation)
2. The knee should be in slight (5° to 10°) flexion. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
3. Avoid areas of high pressure, especially under the Achilles tendon. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
   3.1. Use a foam cushion under the full length of the calves to elevate heels. (Strength of Evidence = B; Strength of Recommendation = Weak positive recommendation)
4. Apply heel suspension devices according to the manufacturer's instructions. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
5. Remove the heel suspension device periodically to assess skin integrity. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

Repositioning for Treating Existing Heel Pressure Ulcers

1. Relieve pressure under the heel(s) with Category/Stage I or II pressure ulcers by placing legs on a pillow to "float the heels" off the bed or by using heel suspension devices. (Strength of Evidence = B; Strength of Recommendation = Weak positive recommendation)
2. For Category/Stage III, IV and unstageable pressure ulcers, place the leg in a device that elevates the heel from the surface of the bed, completely offloading the pressure ulcer. Consider a device that also prevents footdrop. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

Support Surfaces

Support Surface Use

General Recommendations for Mattress and Bed Support Surfaces

1. Select a support surface that meets the individual's needs. Consider the individual's need for pressure redistribution based on following factors:
   - Level of immobility and inactivity
   - Need for microclimate control and shear reduction
   - Size and weight of the individual
   - Risk for development of new pressure ulcers
   - Number, severity, and location of existing pressure ulcer(s) (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
2. Choose a support surface that is compatible with the care setting. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

3. Examine the appropriateness and functionality of the support surface on every encounter with the individual. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
4. Identify and prevent potential complications of support surface use. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
5. Verify that the support surface is being used within its functional life span, as indicated by the manufacturer's recommended test method (or other industry recognized test method) before use of the support surface. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
6. Continue to reposition individuals placed on a pressure redistribution support surface. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
7. Choose positioning devices and incontinence pads, clothing and bed linen that are compatible with the support surface. Limit the amount of linen and pads placed on the bed. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

Mattress and Bed Support Surfaces for Pressure Ulcer Prevention

1. Use a high specification reactive foam mattress rather than a non high specification reactive foam mattress for all individuals assessed as being at risk for pressure ulcer development. (Strength of Evidence = A; Strength of Recommendation = Weak positive recommendation)

   1.1. Review the characteristics of foam mattresses used in the facility for pressure ulcer prevention to ensure they are high specification. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

   1.2. Consider using other reactive support surfaces for individuals assessed as being at risk for pressure ulcer development. (Strength of evidence = C; Strength of Recommendation = Weak positive recommendation)

2. Use an active support surface (overlay or mattress) for individuals at higher risk of pressure ulcer development when frequent manual repositioning is not possible. (Strength of Evidence = B; Strength of Recommendation = Weak positive recommendation)

   Note from the National Guideline Clearinghouse (NGC): In January 2016, the National Pressure Ulcer Advisory Panel (NPUAP), the European Pressure Ulcer Advisory Panel (EPUAP), and the Pan Pacific Pressure Injury Alliance (PPPIA) withdrew recommendation 2.1 on the use of small cell alternating pressure air mattresses or overlays. An explanation of the reason for the retraction can be found at www.internationalguideline.com/statements.

Mattress and Bed Support Surfaces for Individuals with Existing Pressure Ulcers

1. Wherever possible, do not position an individual on an existing pressure ulcer. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
2. Consider replacing the mattress with a support surface that provides more effective pressure redistribution, shear reduction, and microclimate control for the individual if he or she:
   - Cannot be positioned off the existing pressure ulcer
   - Has pressure ulcers on two or more turning surfaces (e.g., the sacrum and trochanter) that limit turning options
   - Fails to heal or demonstrates ulcer deterioration despite appropriate comprehensive care
   - Is at high risk for additional pressure ulcers
   - 'Bottoms out' on the existing support surface (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
3. Before replacing the existing mattress:
   - Evaluate the effectiveness of previous and current prevention and treatment plans.
   - Set treatment goals consistent with the individual's goals, values, and lifestyle. (Strength of Evidence =C; Strength of Recommendation = Strong positive recommendation)
4. Consider using a high specification reactive foam mattress or nonpowered pressure redistribution support surface for individuals with Category/Stage I and II pressure ulcers. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
5. Select a support surface that provides enhanced pressure redistribution, shear reduction, and microclimate control for individuals with Category/Stage III, IV, and unstageable pressure ulcers. (Strength of Evidence = B; Strength of Recommendation = Weak positive recommendation)
6. Select a support surface that provides enhanced pressure redistribution, shear reduction, and microclimate control for individuals with suspected deep tissue injury if pressure over the area cannot be relieved by repositioning. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

General Recommendations on Seating Support Surfaces

1. Individualize the selection and periodic re-evaluation of a seating support surface and associated equipment for posture and pressure redistribution with consideration to:
    - Body size and configuration
    - The effects of posture and deformity on pressure distribution
    - Mobility and lifestyle needs (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
2. Select a stretchable/breathable cushion cover that fits loosely on the top surface of the cushion and is capable of conforming to the body contours. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
   2.1. Assess the cushion and cover for heat dissipation. Select a cushion and cover that permit air exchange to minimize temperature and moisture at the buttock interface. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
3. Inspect and maintain all aspects of a seating support surface to ensure proper functioning and meeting of the individual's needs. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
4. Provide complete and accurate training on use and maintenance of a seating support surface (including wheelchairs) and cushion devices delivered to the individual. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

Seating Support Surfaces to Prevent Pressure Ulcers

1. Use a pressure redistributing seat cushion for individuals sitting in a chair whose mobility is reduced. (Strength of Evidence = B; Strength of Recommendation = Strong positive recommendation)

Seating Support Surfaces for Individuals with Existing Pressure Ulcers

1. Refer individuals to a specialist seating professional for evaluation if sitting is unavoidable. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
2. Select a cushion that effectively redistributes the pressure away from the pressure ulcer. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
3. Use alternating pressure seating devices judiciously for individuals with existing pressure ulcers. Weigh the benefits of off-loading against the potential for instability and shear based on the construction and operation of the cushion. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

<u>Medical Device Related Pressure Ulcers</u>

Risk for Medical Device Related Pressure Ulcers

1. Consider adults with medical devices to be at risk for pressure ulcers. (Strength of Evidence = B; Strength of Recommendation = Strong positive recommendation)
   1.1. Consider children with medical devices to be at risk for pressure ulcers. (Strength of Evidence = B; Strength of Recommendation = Strong positive recommendation)

Recommendations for Selecting and Fitting a Medical Device

1. Review and select medical devices available in the facility based on the devices' ability to induce the least degree of damage from the forces of pressure and/or shear. (Strength of Evidence = B; Strength of Recommendation = Strong positive recommendation)
2. Ensure that medical devices are correctly sized and fit appropriately to avoid excessive pressure. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
3. Apply all medical devices following manufacturer's specifications. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
4. Ensure that medical devices are sufficiently secured to prevent dislodgement without creating additional pressure. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

Recommendations for Assessment of the Skin and Medical Device

1. Inspect the skin under and around medical devices at least twice daily for the signs of pressure related injury on the surrounding tissue. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)
   1.1. Conduct more frequent (greater than twice daily) skin assessments at the skin-device interface in individuals vulnerable to fluid shifts and/or exhibiting signs of localized or generalized edema. (Strength of Evidence= C; Strength of Recommendation = Strong positive recommendation)
2. Classify medical device related pressure ulcers using the International NPUAP/EPUAP Pressure Ulcer Classification System, with the

exception of mucosal pressure ulcers. (Strength of Evidence= C; Strength of Recommendation = Weak positive recommendation)

3. Educate the individual with a medical device in the community setting and his/her caregivers to perform regular skin inspections. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

Recommendations for Prevention of Medical Device Related Pressure Ulcers

1. Remove medical devices that are potential sources of pressure as soon as medically feasible. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
2. Keep skin clean and dry under medical devices. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
3. Reposition the individual and/or the medical device to redistribute pressure and decrease shear forces. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)
   3.1. Do not position the individual directly on a medical device unless it cannot be avoided. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

   3.2. Reposition the individual to redistribute pressure and shear forces created by the medical device. (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

   3.3. Rotate or reposition medical devices when possible. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

   Caution: Always validate that the depth of an endotracheal (ET) tube does not change with tube manipulation.

   3.4. Provide support for medical devices as needed to decrease pressure and shear forces. (Strength of Evidence = C; Strength of Recommendation = Weak positive recommendation)

4. Consider using a prophylactic dressing for preventing medical device related pressure ulcers. (Strength of Evidence = B; Strength of Recommendation = Weak positive recommendation)
   Caution: Avoid excessive layering of prophylactic dressings that may increase pressure at the skin-device interface.

   4.1. When selecting a prophylactic dressing consider:

   - Ability of the dressing to manage moisture and microclimate, especially when used with a medical device that may be in contact with bodily fluids/drainage (e.g., percutaneous endoscopic gastrostomy tube)
   - Ease of application and removal
   - Ability to regularly assess skin condition
   - Thickness of the dressing under tightly fitting devices
   - Anatomical location of the medical device
   - Type/purpose of the medical device (Strength of Evidence = C; Strength of Recommendation = Strong positive recommendation)

Definitions:

Strength of Evidence Rating

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.

Strength of Recommendation Grade

Recommendation	Description	Implication
Do it (Strong recommendation for using an intervention)	Indicates a judgment that most well informed people would make.	*For patient consumers*—Most people would want the recommended course of action and only a small proportion would not. *For health professionals*—Most people should receive the intervention. If health professionals choose not to follow the recommendation, they should document their rationale. *For quality monitors*—Adherence to this recommendation could be used as a quality criterion or performance indicator.
Don't do it (Strong recommendation against using an intervention)		
Probably do it (Weak recommendation for using an intervention)	Indicates a judgment that a majority of well informed people would make, but a substantial minority would not.	*For patient consumers*—Most people would want the suggested course of action, but many would not. *For health professionals*—Examine, and be prepared to discuss, the evidence with patients, as well as their values and preferences. *For quality monitors*—Clinicians' discussion and consideration of pros and cons of the intervention, and documentation of discussion, could be used as a quality indicator.
Probably don't do it (Weak recommendation against using an intervention)		
No specific recommendation	Trade-offs between risk and benefit unclear or lack of agreement between voting participants.	The advantages and disadvantages are equivalent; and/or the target population has not been identified; and/or there is insufficient evidence on which to formulate a strength of recommendation.

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Pressure ulcers

Guideline Category

Evaluation

Management

Prevention

Risk Assessment

Screening

Treatment

Clinical Specialty

Critical Care

Dermatology

Family Practice

Geriatrics

Internal Medicine

Nursing

Nutrition

Preventive Medicine

Surgery

Intended Users

Advanced Practice Nurses

Allied Health Personnel

Dietitians

Health Care Providers

Hospitals

Nurses

Patients

Physician Assistants

Physicians

Guideline Objective(s)

- To provide evidence-based recommendations for the prevention and treatment of pressure ulcers that could be used by health care professionals throughout the world
- To guide evidence-based care to prevent the development of pressure ulcers and to provide evidence-based guidance on the most effective strategies to promote pressure ulcer healing

Target Population

Individuals with pressure ulcers or at risk of developing pressure ulcers

Interventions and Practices Considered

1. Nutrition in pressure ulcer prevention and treatment
    - Nutrition screening using a valid screening tool to determine nutritional risk
    - Referral for a comprehensive nutrition assessment
    - Nutrition assessment: weight status, the individual's ability to eat independently, adequacy of total nutrient intake
    - Developing an individualized nutrition care plan
    - Providing individualized energy intake based on underlying medical condition and level of activity
    - Offering fortified foods and/or high-calorie, high-protein oral nutritional supplements
    - Considering enteral or parenteral nutritional support when oral intake is inadequate
    - Providing adequate protein for positive nitrogen balance
    - Assessing renal function to ensure that high levels of protein are appropriate for the individual
    - Supplementing with high protein, arginine and micronutrients
    - Providing and encouraging adequate daily fluid intake for hydration

    - Providing and encouraging adequate vitamins and minerals, including supplementation as needed
2. Repositioning and early mobilization
    - Repositioning all individuals at risk of, or with existing pressure ulcers, unless contraindicated
    - Determining repositioning frequency based on individual characteristics
    - Establishing pressure relief schedules that prescribe the frequency and duration of weight shifts
    - Teaching individuals to do "pressure relief lifts" or other pressure relieving maneuvers
    - Regularly assessing the individual's skin condition and general comfort
    - Repositioning techniques (e.g., use of manual handling aids, split-leg sling mechanical lift)
    - Avoiding positioning the individual directly onto medical devices
    - Avoiding leaving the individual on a bedpan longer than necessary
    - Repositioning individuals in bed (lying positions)
    - Repositioning seated individuals
    - Positioning considerations for individuals with existing pressure ulcers
    - Use of positioning devices
    - Developing a mobilization schedule
    - Repositioning documentation
    - Repositioning to prevent and treat heel pressure ulcers
        - Use of heel suspension devices
        - Use of a foam cushion under the full length of the calves to elevate heels
        - Repositioning for treating existing heel pressure ulcers
    - Avoiding positioning the individual directly onto an existing pressure ulcer
    - Early mobilization or measures to increase activity as rapidly as tolerated
3. Support surfaces
    - Selecting a support surface that meets the individual's needs
    - Mattress and bed support surfaces for pressure ulcer prevention: use of high-specification reactive foam mattress and other reactive support surfaces
    - Mattress and bed support surfaces for individuals with existing pressure ulcers: use of high-specification reactive foam mattress or nonpowered pressure redistribution support surface; use of support surfaces that provide enhanced pressure redistribution, shear reduction, and microclimate control
    - Individualized selection and periodic re-evaluation of seating support surfaces and associated equipment for posture and pressure redistribution
4. Medical device related pressure ulcers
    - Risk assessment for medical device related pressure ulcers
    - Selecting and fitting medical devices to avoid excessive pressure
    - Assessment of the skin under and around medical devices
    - Classifying medical device related pressure ulcers
    - Prevention of medical device related pressure ulcers: removing medical devices that are potential sources of pressure as soon as medically feasible; keeping skin clean and dry under medical devices; repositioning the individual and/or the medical device to redistribute pressure and decrease shear force; providing support for medical devices as needed to decrease pressure and shear forces; using a prophylactic dressing

Note: The pressure ulcer clinical practice guideline was divided into four individual summaries. Additional interventions are discussed in the following summaries:

Prevention of pressure ulcers
Treatment of pressure ulcers
Special populations

Major Outcomes Considered

- Malnutrition rates in older patients
- Sensitivity and specificity of nutrition screening tools
- Pressure ulcer healing rates
- Effectiveness of interventions on ulcer healing

- Hospital lengths of stay
- Morbidity and mortality
- Incidence of facility-acquired pressure ulcers
- Development of a new pressure ulcer
- Category/Stage I or greater pressure ulcer or equivalent

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Identifying the Evidence

Databases

The Guideline Development Group (GDG) identified clinical questions to guide literature searches. To identify the scientific literature on pressure ulcer prevention and treatment, several electronic databases were consulted, including: PubMed, CINAHL, MEDLINE, EMBASE, Scopus, Biomedical Reference Collection, Health Business Elite, The Cochrane Database of Systematic Reviews, The Cochrane Central Register of Controlled Trials, Health Technology Assessment, and AMED databases. As the guideline builds on a previously published body of evidence, the search dates for this update were 1st January 2008 through 1st July 2013. Some Small Working Groups (SWGs), particularly those that were addressing evidence in topics newly introduced in this version of the guideline, used different inclusion dates, as per the inclusion and exclusion criteria detailed below.

Search Strategy

A sensitive search strategy was developed and made available on the guideline website. The SWGs were permitted to conduct additional focused searches to ensure the full depth and breadth of their topic area has been covered.

Inclusion and Exclusion Criteria

All references retrieved by the electronic literature search were screened by the methodologist (during the interim period between guideline development periods from 2009 to 2012) based on the following inclusion criteria:

General Eligibility Criteria

Inclusion criteria:

- The articles must be primarily focused on pressure ulcer prevention, risk assessment, or pressure ulcer treatment in human subjects.
- The articles must have been published in a peer reviewed journal.
- An abstract must be available.
- The studies should have used one of the following designs: randomized controlled trials (RCTs), controlled clinical trials (CCTs), quasi-experimental studies, cohort studies, cross-sectional studies, survey studies, prevalence or incidence studies, case-control studies, and case series.
- At least ten subjects must have been included in any case series.
- Systematic reviews or meta-analyses were included if they used the Cochrane methodology or met at least 9 out of 11 quality criteria of the critical appraisal tool Assessment of Multiple Systematic Reviews (AMSTAR).
- SWG members reviewed, analyzed and used the original articles cited in systematic reviews and meta-analyses as the basis for guideline recommendations and systematic reviews were cited as additional supporting evidence. In order to rate the level of evidence, the quality of the systematic review was assessed, using the AMSTAR checklist. Meta-analyses should not be equated with systematic reviews.
- Studies using established qualitative methodologies were considered as appropriate to the research question.
- There was no restriction on the basis of the language of a study. However, studies published in languages other than English were required to indicate a high level of quality and unique data in the abstract report to warrant translation.

Exclusion criteria:

- Non-systematic literature reviews, narrative papers, opinion, commentary and descriptive papers. Papers falling into this category were used only to support expert opinion as required.
- Case series with less than 10 participants.
- Conference abstracts or other short papers with insufficient detail to enable an appraisal of the study methodology.
- Duplicate reports of research.
- Computational modeling and other research conducted in non-human subjects.
- Systematic reviews and meta-analyses that do not meet at least 9 of 11 criteria on the AMSTAR checklist.
- Papers without a substantial focus on pressure ulcer prevention or treatment or risk assessment.
- Foreign language studies for which the abstract does not indicate a high level study (i.e., at least Level 2) with unique data.

Eligibility Criteria for Research Reporting on Quality Improvement and Education

In addition to the criteria outlined above, additional inclusion criteria were:

- Articles with a time series design with at least three outcome measurement time points.
- Project should be institution-wide (i.e., not individual units). Projects in individual units could be covered in special population sections as appropriate (e.g., pediatrics, critical care).
- Outcomes should be incidence or facility-acquired pressure ulcer rates.
- Quality improvement projects should be described in sufficient detail to enable replication (i.e., specific methods used, barriers and facilitators).

Exclusion criteria:

- Publications before January 2008 and after December 2012 were not appraised for this guideline section.

Eligibility Criteria for Research Reporting on Risk Factors for Pressure Ulcers

The systematic review by Coleman et al., 2013 (see the "Availability of Companion Documents" field) was used as a basis for literature selection to identify patient characteristics that increase the probability of pressure ulcer development. This was supplemented by a search for literature published from 31st March 2010 to July 1st 2013.

Refer to Appendix 1: Methodology in the original guideline document for inclusion and exclusion criteria used by Coleman et al. (see also the Methodology addendum [see the "Availability of Companion Documents" field]).

Eligibility Criteria for Research Reporting on Risk Assessment Tools

Additional inclusion criteria for papers addressing the reliability of risk assessment tools were:

- Risk assessment tools are completed by qualified health professionals.
- The research involved comparing pressure ulcer risk assessment tool scores of different raters using the same scale (interrater) or comparing pressure ulcer risk assessment tool scores of the same raters using the same scale at different times (intrarater).

The systematic review by Chou et al., 2013 (see the "Availability of Companion Documents" field) was used as a basis for literature selection related to identifying the validity of risk assessment tools. This was supplemented by literature published after the end of the review period (i.e., from 31st July 2012 to 1st July 2013).

Additional inclusion criteria for papers addressing the validity of risk assessment tools were:

- Prospective study design (i.e., RCTs, CCT, prospective cohort study).
- Reporting the evaluation of one or more risk assessment tool in the prevention of pressure ulcers (analytical methods).
- Follow-up data included on at least 75% of participants.
- Participants were aged over 18 years.
- Individuals were assessed systematically for the development of new pressure ulcers (e.g., all participants have baseline skin assessment and at follow-up intervals suitable to identify new pressure ulcers in the study population). Assessment only at baseline and discharge is not a suitable follow-up to detect all new pressure ulcers.
- Risk assessment tools are completed at baseline.
- Outcome clearly defined as development of a Category/Stage I or greater pressure ulcer.

- Analysis methods: sensitivity, specificity, positive likelihood ratio (PLR), negative likelihood ratio (NLR), relative risk and area under the receiver operating characteristic (AUROC) curve.

Exclusion criteria:

- Data used to generate the risk assessment tool are the same data used for the calculation of validity measures.

Number of Source Documents

A total of 356 papers were newly included in the guideline after the appraisal of papers in the updated literature search (search dates: 1st January 2008 through 1st July 2013).

As the 2014 guideline builds on the 2009 guideline, this number does not include papers that were already identified and included in the 2009 guideline.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Level of Evidence for Intervention Studies

Level 1	Randomized trial(s) with clear-cut results and low risk of error OR systematic literature review or meta-analysis according to the Cochrane methodology or meeting at least 9 out of 11 quality criteria according to Assessment of Multiple Systematic Reviews (AMSTAR) appraisal tool
Level 2	Randomized trial(s) with uncertain results and moderate to high risk of error
Level 3	Non randomized trial(s) with concurrent or contemporaneous controls
Level 4	Non randomized trial(s) with historical controls
Level 5	Case series with no controls. Specify number of subjects

Levels of Evidence for Diagnostic Studies

Level 1	Systematic review of high quality (cross sectional) studies according to the quality assessment tools with consistently applied reference standard and blinding
Level 2	Individual high quality (cross sectional) studies according to the quality assessment tools with consistently applied reference standard and blinding among consecutive persons
Level 3	Non-consecutive studies, or studies without consistently applied reference standards
Level 4	Case-control studies, or poor or non-independent reference standard
Level 5	Mechanism-based reasoning, study of diagnostic yield (no reference standard)

Levels of Evidence for Prognostic Studies

Level 1	Systematic review of high quality (longitudinal) prospective cohort studies according to the quality assessment tools
Level 2	A prospective cohort study
Level 3	Analysis of prognostic factors amongst persons in a single arm of a randomized controlled trial

Level 4	Case-series or case-control studies, or poor quality prognostic cohort study, retrospective cohort study
Level 5	Not applicable

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Direct vs. Indirect Evidence

Studies of pressure ulcers in humans and individuals at risk of, or with existing pressure ulcers were considered 'direct evidence' and were required to support an A or B '*strength of evidence*' rating (see the "Rating Scheme for the Recommendations" field). When studies of pressure ulcers in humans at risk of, or with existing pressure ulcers were not available, studies in normal human subjects, human subjects with other types of chronic wounds, laboratory studies using animals, or computational models were used as indirect evidence to support recommendations with a C '*strength of evidence*' rating.

Evaluating the Evidence

Appraisal of Methodological Quality

The methodological quality of each study was evaluated by two members of the Small Working Groups (SWGs). Where large discrepancy of opinion was noted (such that the paper's overall quality was rated differently by the two reviewers), a third reviewer evaluated the paper. The methodologist completed a quality check on a random sample of 80% of the critical appraisals for papers selected for potential appraisal, including those papers that the SWG assessed as not meeting inclusion criteria.

The methodological quality of each study was assessed by two reviewers using methodology checklists that were based on tools developed by the Scottish Intercollegiate Guidelines Network. Evaluation of study quality focused on the internal and external validity of the studies. The following quality criteria were considered: internal validity of the study; clear and appropriate research question(s); selection of subjects; allocation; baseline comparability; outcomes; blinding; confounding factors; statistical analysis; overall assessment of the study; and bias. A range of critical appraisal tools were used based on different types of study design: cross-sectional/survey/prevalence studies, case-control studies, cohort studies, randomized controlled trials (RCTs), quasi-experimental studies, diagnostic studies, SQUIRE guideline checklist for quality improvement papers, Critical Appraisal Skills Program (CASP) Qualitative Research Checklist, AMSTAR criteria for systematic reviews.

Each criterion on the critical appraisal forms was assessed as being fully met (++), partially met (+), not met/not reported/unclear (—), or not applicable (NA). Studies were generally described as high, moderate, or low quality using the following criteria:

- High quality studies: fully met at least 80% of applicable criteria
- Moderate quality studies: partially or fully met at least 70% of applicable criteria
- Low quality studies: did not partially or fully met at least 70% of applicable criteria

Appraisal of Methodological Quality for Risk Factor Papers

In the absence of guidelines for the quality assessment of risk factor studies, Coleman et al., 2013 (see the "Availability of Companion Documents" field) used an assessment framework based upon guidelines for assessing quality and risk of bias in prognostic studies and methodological considerations in the analysis, meta-analysis and publication of observational studies. Each study was appraised using the method described by Coleman et al. and the following factors were considered:

- Baseline characteristics are adequately described
- Study attrition: clear definition of risk factors
- Continuous variables used or appropriate cut-points for continuous data
- Risk factor measurement valid and reliable
- Method/sampling of measurement used for all individual patients
- Appropriate imputation methods
- Appropriate classification for outcome

- Potential confounders accounted for in study design
- Potential confounders accounted for in analysis
- No selective reporting

See Appendix 1 in the original guideline document and the Methodology addendum (see the "Availability of Companion Documents" field) for more information on appraisal of methodological quality for risk factor papers.

Level of Evidence

The level of evidence for individual intervention studies was noted for each study containing direct evidence, using a classification system adapted from Sackett, 1989 (see the "Rating Scheme for the Strength of the Evidence" field).

Levels of evidence are typically applied to intervention studies (e.g., RCTs, controlled clinical trials [CCTs], or case series studies) because these types of studies are regarded as most important knowledge sources for clinical decision making. However, there are many more study designs (e.g., epidemiological or descriptive studies) that provide valuable evidence to guide practice, yet cannot be classified with an intervention-based level of evidence system.

Studies on diagnostic and prognostic validity of pressure ulcer risk and pressure ulcer classification form an important body of knowledge in pressure ulcer management that should be appraised independently from intervention studies. Diagnostic accuracy studies are studies in which results of index tests are compared with results from reference standards at the same point in time. Therefore, cross-sectional designs are needed to establish the concurrent existence of both index test and reference standard results. Most studies in pressure ulcer risk research are not diagnostic accuracy studies according to this widely agreed upon definition, because the measured pressure ulcer risk is often compared with subsequent pressure ulcer occurrence. These designs resemble those of prognostic studies or diagnostic accuracy studies with imperfect reference standards.

Comparable to different phases of intervention research phases of diagnostic and prognostic research can also be distinguished. In diagnostic research, Phase I and II studies focus on differentiation between individuals with the target from those without. Phase III studies are typical diagnostic accuracy studies whereas phase IV research investigates the clinical impact of diagnostic procedures. Prognostic studies are comparable with diagnostic accuracy studies with the difference that based on factors or diagnostic cues future events are predicted. These types of studies are typically used to develop prognostic models. Prognostic models (e.g., pressure ulcer risk assessment tool scores), are used to predict the probability of future events in individuals or groups.

Test accuracy and validity estimates are only surrogate measures for clinical effectiveness. The clinical effectiveness of diagnostic test procedures can only be adequately investigated by diagnostic RCTs. In case of diagnostic or prognostic RCTs the described level of evidence hierarchy of intervention studies is used.

Corresponding "level of evidence" hierarchies for diagnostic and prognostic accuracy and many other studies have been proposed and have been adopted by the Guideline Development Group (GDG) in the guideline update (see the "Rating Scheme for the Strength of the Evidence" field).

The technical documents summarizing critical appraisals of included studies are made available at the guideline website (see the "Availability of Companion Documents" field).

Data Extraction

The full papers of selected references were obtained and made available to the relevant SWGs on a web-based (GoogleDocs) platform.

A data extraction template was used to extract relevant data from individual papers, including study design, description of participants, study groups and interventions, outcome measures, length of follow up, study results, and comments and limitations. Preliminary data extraction tables were prepared in the interim development period (i.e., period between the publication of the 2009 guideline and the commencement of the 2014 guideline development period).

The members of the SWGs were provided with the preliminary data extraction tables for checking, expanding on details and adding studies that had not yet undergone data extraction. The methodologist completed a quality check of a random sample of 80% of the completed evidence tables and the GDG completed a quality check of a random sample of 10% of the completed evidence tables.

The technical documents summarizing data extraction of included studies are made available at the guideline website (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

Participants

All members of the development team were screened for experience, expertise and potential conflicts of interest. In the interest of transparency, all guideline developers were asked to complete a form identifying potential conflicts of interest that covered the guideline review period.

Guideline Development Group

This second edition of the guideline was conducted by European Pressure Ulcer Advisory Panel (EPUAP), National Pressure Ulcer Advisory Panel (NPUAP) and the Pan Pacific Pressure Injury Alliance (PPPIA). The Pan Pacific Alliance consists of the Australian Wound Management Association Incorporated (AWMA), the New Zealand Wound Care Society (NZWCS), the Hong Kong Enterostomal Therapist Society and the Wound Healing Society of Singapore.

The Guideline Development Group (GDG) determined and monitored each step of the guideline development process, as well as managing guideline dissemination strategy. Each of the three partner organizations nominated four representatives each to form the 12 member GDG. From its nominated representatives, each partner organization appointed a Chair. The three partner organizations each had four votes during joint deliberations, with the majority deciding. Examination of the evidence and consensus building preceded all voting. Minority opinions were represented in meeting minutes. A full description of the GDG role is available on the guideline website.

A nonvoting observer from the Japanese Society of Pressure Ulcers (JSPU) attended GDG meetings during the 2014 revision process, with the option to join the GDG for the next revision.

Small Working Groups

The guideline content was divided into working topic areas, and Small Working Groups (SWGs) were formed to review the evidence available for each topic. The SWG members were selected by each participating organization based on an experience and expertise. Representatives of industry were excluded from SWGs. The SWGs were formed based on the principle of equal contribution from all participating organizations. A full description of the SWG role is available on the guideline website. A total of 104 SWG members contributed to the guideline development process, with many members contributing to more than one SWG.

Guideline development was an iterative process, with GDG and SWG members maintaining communication via the methodologist. Evidence summaries and draft recommendations developed by the SWGs were reviewed by the GDG for:

- Comprehensiveness and accuracy of literature reviews
- Methodological rigor in evidence analysis and application to clinical practice
- Clarity and appropriateness of recommendations for an international audience

Methodologist

The guideline process was overseen by an experienced guideline methodologist. The methodologist assisted the SWG members in implementing the documented methodology, appraising and summarizing the new literature, revising the 2009 guideline recommendations and developing new recommendations, and presenting the evidence. The methodologist also managed the confidential consensus voting process (Grading of Recommendations Assessment, Development and Evaluation [GRADE]). The methodologist provided a link between the GDG and the SWG, managing communication and maintaining progress. The methodologist attended GDG and SWG meetings, but did not participate in GDG voting.

Stakeholders

The entire process of developing the guideline was made available to stakeholders on the guideline website. Anyone was invited to register as a stakeholder, either as an individual or as a representative for a society/organization. All members of the EPUAP, NPUAP and PPPIA were invited to register as stakeholders and participate in this process. When new sections of the guideline were made available on the guideline website, registered stakeholders were notified by electronic mail. The GDG reviewed all stakeholder comments and any additional evidence recommended by stakeholders before approving final recommendations.

Drafting/Revising Recommendations

Based on the identified, appraised and summarized empirical evidence recommendations were formed. Each SWG formulated conclusions about the body of available evidence based on the evidence tables and critical appraisals and levels of evidence. Evidence tables from previous guidelines were also made available to SWGs to ensure the full body of scientific literature was reviewed. A first draft of recommendations was developed by the respective SWGs using the 2009 guideline recommendations as a guide. The GDG reviewed the draft recommendations, making revisions as necessary.

To ensure uniformity and internal consistency in the final guideline, the GDG provided the following guidance.

- Each recommendation should start with an action verb and be a simple, short, direct, declarative statement, free of jargon.
- Multiple complex recommendations were broken down into a series of smaller, discrete recommendations.
- The SWGs were advised to start with broad, directive statements, followed by subsequent statements with more detail (how, when, how often).
- Recommendations should be specific and unambiguous.
- When available, information on health benefits, side effects and risks should be provided.
- Spelling will be based on the conventions of American English.

The GDG reviewed all recommendations to ensure the wording of the recommendations accurately translated available research into best practice while being sensitive to the many different individual cultures and professional standards represented among the international audience for these guidelines.

The term "individual" was selected to describe the patient, client, resident, or person with a pressure ulcer or at risk for a pressure ulcer. The terms "health professional" and "interprofessional team" were used when referring to health professional providing professional health care services to the individual. The disciplines of professionals performing a given service may vary from country to country based on the laws and regulations governing health care providers. Products available in one country may not be available in another. Generic names were used when referring to drugs and other products.

Assigning Strength of Evidence Ratings

'*Strength of evidence*' ratings were assigned to recommendations (see the "Rating Scheme for the Strength of the Recommendations" field). This rating identifies the strength of cumulative body of evidence supporting each recommendation.

A '*strength of evidence*' rating of A requires Level 1 studies conducted in individuals with pressure ulcers or at risk for pressure ulcers. This rating is consistent with recommendations derived using the Cochrane methodology. '*Strength of evidence*' ratings of B required Level 2, 3, 4, and/or 5 studies in these populations. Recommendations supported by A and B '*strength of evidence*' ratings were developed first. This strategy provided recommendations with very direct evidentiary support. Where the guideline was considered to lack the breadth and depth of guidance necessary to provide care, additional recommendations based on expert opinion and/or indirect evidence and given a '*strength of evidence*' rating of C were developed to fill the evidence gap.

The '*strength of evidence*' supporting the recommendation is not the same as the '*strength of the recommendation*'. For example, there are no randomized controlled trials in individuals with pressure ulcers that evaluate debridement compared to no debridement. Therefore, this recommendation would have a relatively low '*strength of evidence*' supporting the recommendation, yet the recommendation is strongly recommended in many clinical situations based on evidence from studies of other types of chronic wounds, proof of principle from basic science research, and/or expert opinion.

In this guideline, evidence gaps have been explicitly identified. Systematic literature reviews were conducted to identify indirect evidence from studies of normal subjects, studies with intermediate or surrogate outcomes, studies of humans with other types of chronic wounds, and animal studies. For many recommendations, indirect evidence may be identified to support C '*strength of evidence*' ratings. In the absence of indirect evidence, consensus from previous guidelines or expert opinion may support C '*strength of evidence*' ratings, providing a broader base of expert opinion than that available in the SWGs and GDG. The SWG members were encouraged to evaluate previous guidelines for quality using the AGREE II Tool. All recommendations, including those supported solely by expert opinion were reviewed by stakeholders.

Summarizing Supporting Evidence

The SWGs summarized the evidence supporting each recommendation. An explicit link between the recommendation and supporting evidence was expected. The strengths and limitations of this body of evidence were clearly described. All recommendations with a '*strength of evidence*' rating of A or B required an explicit summary of one or more studies conducted with human subjects with pressure ulcers or at risk for pressure ulcer development. The '*level of evidence*' for each study is also identified in the summary.

The summary statements for recommendations with a '*strength of evidence*' of C clarify whether the recommendation was supported by:

- Indirect evidence from studies of normal subjects
- Studies with intermediate or surrogate outcomes
- Studies of humans with other types of chronic wounds, and animal studies or other basic bench research
- Expert opinion supported by previous evidence-based guidelines
- The expert opinion of the SWG and GDG members as reviewed by international stakeholders.

Evidence gaps identified in these summary statements serve as an agenda for future research efforts.

Assigning Strength of Recommendation Grades

The recommendations are rated based on their importance and their potential to improve individual patient outcomes. The '*strength of recommendation*' is the extent to which a health professional can be confident that adherence to the recommendation will do more good than harm. The grading of importance is not necessarily related to the strength of internal or external evidence. The overall aim is to help health professionals to prioritize interventions. See the original guideline document for points to be considered in grading the strength of recommendations.

The '*strength of recommendation*' grades were achieved via a formal consensus process using the GRADE grid (see Table 5 in Appendix 1 in the original guideline document and in the Methodology addendum [see the "Availability of Companion Documents" field)]. In this consensus process all SWG and the GDG members were invited to take part, each voting on every recommendation in the guideline. The consensus voting process (GRADE) was conducted on the website. Each guideline development team member was provided with a unique identification. Before commencing in the GRADE process, the methodology was outlined, including the considerations to be made in casting a vote. The participant was required to nominate their understanding of the procedure before commencing, or to request further information.

See the "Rating Scheme for the Strength of the Recommendations" field and the original guideline document for additional information on assigning strength of recommendation grades.

Rating Scheme for the Strength of the Recommendations

Strength of Evidence Rating

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.

Strength of Recommendation Grade

Recommendation	Description	Implication
Do it (Strong recommendation for using an intervention)	Indicates a judgment that most well informed people would make.	*For patient consumers*—Most people would want the recommended course of action and only a small proportion would not. *For health professionals*—Most people should receive the intervention. If health professionals choose not to follow the recommendation, they should document their rationale. *For quality monitors*—Adherence to this recommendation could be used as a quality criterion or performance indicator.
Don't do it (Strong recommendation against using an intervention)		
Probably do it (Weak recommendation for using an intervention)	Indicates a judgment that a majority of well informed people would make, but a substantial minority would not.	*For patient consumers*—Most people would want the suggested course of action, but many would not. *For health professionals*—Examine, and be prepared to discuss, the

Recommendation	Description	Implication
Probably don't do it (Weak recommendation against using an intervention)		evidence with patients, as well as their values and preferences. *For quality monitors*—Clinicians' discussion and consideration of pros and cons of the intervention, and documentation of discussion, could be used as a quality indicator.
No specific recommendation	Trade-offs between risk and benefit unclear or lack of agreement between voting participants.	The advantages and disadvantages are equivalent; and/or the target population has not been identified; and/or there is insufficient evidence on which to formulate a strength of recommendation.

Cost Analysis

The guideline developers reviewed published cost analyses.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

Stakeholders

The entire process of developing the guideline was made available to stakeholders on the guideline website. A stakeholder is someone who has interest in pressure ulcers and wishes to contribute to the guideline by reading the methodology, search strategies, references under consideration, and draft recommendations, ensuring that all relevant evidence had been included and commenting on the draft guideline within the timeframes allowed. All members of the European Pressure Ulcer Advisory Panel (EPUAP), National Pressure Ulcer Advisory Panel (NPUAP), and the Pan Pacific Pressure Injury Alliance (PPPIA) were invited to register as stakeholders and participate in this process.

In 2009, a total of 903 individuals and 146 societies/organizations registered as stakeholders. These stakeholders were all invited to register as stakeholders for the 2014 guideline. Additionally, patient representative organizations were also invited to participate in the stakeholder review process to provide a consumer perspective. A total of 988 individuals were formally invited to register as stakeholders, and many more received information about the process through colleagues and organizations. A total of 698 individuals registered as stakeholders to provide feedback as an individual or in representation of a society/organization.

When new sections of the guideline were made available on the guideline website, registered stakeholders were notified by electronic mail. The Guideline Development Group (GDG) reviewed all stakeholder comments and any additional evidence recommended by stakeholders before approving final recommendations.

Final Review and Recommendations

Following review and approval of individual recommendations, the methodologist and the GDG reviewed all guideline documents for internal consistency, logical coherence and adherence to the guideline methodology. Based on this final review, the GDG will provide a global assessment of the strengths and limitations of the body of evidence supporting the guideline and recommendation for future research.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Appropriate interventions for prevention and treatment of individuals with pressure ulcers

Potential Harms

- A cohort study examined the effectiveness of tube feeding in preventing pressure ulcers or promoting their healing. Study participants included 461 subjects with both a pressure ulcer and a percutaneous endoscopic gastrostomy (PEG) tube. Results showed that the risk of new Category/Stage II or greater pressure ulcers was more than twice as high (odds ratio [OR] = 2.27, 95% confidence interval [CI] 1.95 to 2.65) when a PEG was present. The risk of a new Category/Stage IV pressure ulcer when a feeding tube was present was OR = 3.31 (95% CI 2.14 to 4.89). In participants who had a PEG inserted, 27.2% of pressure ulcers improved compared with 34.6% in participants with no PEG (OR = 0.66, 95% CI 0.45 to 0.97). The increased risk may be related to increased diarrhea, increased immobility or comorbidities, but this was not investigated. The investigators concluded that PEG feeding tubes are not beneficial and may be associated with increased risk of pressure ulcers.
- High dose zinc supplementation (above 40 mg per day) can adversely affect copper status, possibly resulting in anemia.
- Beds that produce air flow at the skin interface can accelerate the evaporation of perspiration and can in some cases lead to dehydration. This insensible loss should be considered in daily fluid intake. Beds 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 be noisy, may generate heat, and can have motion. One trial conducted in older women confined to bed (n = 10) reported that automated tilted beds were associated with a non-significant change in high frequency components of the heart rate; however, this is an infrequent occurrence (indirect evidence).
- Detrimental effects such as epidermal stripping may occur with frequent removal of adhesive-based dressings. Be aware of tubes and medical devices that can become entrapped in skin folds resulting in skin damage, especially in the bariatric population.
- When prophylactic dressings such as hydrocolloids are used, consider the fragility of the individual's skin and the ease of removal of the dressing when performing routine skin assessments. Detrimental effects such as epidermal stripping may occur with frequent removal of adhesive-based dressings. Be aware of tubes and medical devices that can become entrapped in skin folds resulting in skin damage, especially in the bariatric population.

Qualifying Statements

Qualifying Statements

The recommendations in this guideline are a general guide to appropriate clinical practice, to be implemented by qualified health professionals subject to their clinical judgment of each individual case and in consideration of the patient consumer's personal preferences and available resources. The guideline should be implemented in a culturally aware and respectful manner in accordance with the principles of protection, participation and partnership.

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 of 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 Guideline Development Group members believe that the research supporting these recommendations is reliable and accurate. Every effort has been made to critically appraise the research contained within this document. However, they do not guarantee the reliability and accuracy of individual studies referenced in this document.
- This guideline is 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 or her clinical decision making.
- Generic names of products have been 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.

- The guideline does not seek to provide full safety and usage information for products and devices; however commonly available safety and usage tips have been included. Adverse events reported in the included research have been reported in the evidence summaries and caution statements. All products should be used according to manufacturer's directions.

Implementation of the Guideline

Description of Implementation Strategy

The newly introduced implementation section of the guideline addresses systems and strategy at an organization and professional level that are required for effective implementation of the clinical recommendations in this guideline. This includes sections addressing implementation strategy, health professional education, recommendations specifically for patient consumers and their caregivers, and quality indicators for monitoring guideline implementation.

Facilitators, Barriers and Implementation Strategy

This section of the guideline provides a review of quality improvement research published from 1st January, 2008 to 31st December, 2012. Quality of evidence in this field is extremely varied, and the Small Working Group (SWG) narrowed the research by seeking evidence of sustained effectiveness of reproducible interventions. Assessment of potential barriers and facilitators to guideline implementation, including education level of staff and appropriate equipment is essential prior to the introduction of a pressure ulcer prevention protocol. The evidence supporting practical strategies including nurse-led quality improvement, introduction of wound care specialists and awareness campaigns is presented.

Health Professional Education

Negative attitudes and lack of knowledge are common barriers to using guidelines in clinical practice. This section of the guideline provides a review of research on the effectiveness of strategies related to health professional education published from 1st January, 2008 to 31st December, 2012. Recommendations on the format, content and evaluation of education programs are made.

Patient Consumers and Their Caregivers

The patient consumer and his or her informal caregivers play an important role in pressure ulcer prevention. Knowledge of pressure ulcers and their prevention is important, and requires a special emphasis in those at high risk. This section of the guideline discusses responsibilities of the patient consumer to attain information and work with health professionals in order to prevent and treat pressure ulcers. The section also provides guidance on the selection and maintenance of equipment.

Quality Indicators for This Guideline

Monitoring of practice is an important component of continuous quality improvement. The quality indicators identified in this section of the guideline are intended for auditing the implementation of this clinical guideline in practice. The identified quality indicators are those that are considered important indicators of successful implementation of the guideline and delivery of quality pressure ulcer prevention and treatment. The indicators could be used by organizations who introduce the evidence-based practices recommended within this guideline, and may be measured in conjunction with other quality indicators (e.g., those associated with facility accreditation) to determine progress in provision of quality care and identify areas for improvement.

See the "Implementing the Guideline" section in the original guideline document for specific implementation recommendations.

Implementation Tools

Audit Criteria/Indicators

Quick Reference Guides/Physician Guides

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report

Categories

IOM Care Need

End of Life Care

Getting Better

Living with Illness

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, Pan Pacific Pressure Injury Alliance. Interventions for prevention and treatment of pressure ulcers. In: Prevention and treatment of pressure ulcers: clinical practice guideline. Washington (DC): National Pressure Ulcer Advisory Panel; 2014. p. 79-125. [212 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2009 (revised 2014)

Guideline Developer(s)

European Pressure Ulcer Advisory Panel - Independent Expert Panel

National Pressure Ulcer Advisory Panel - Independent Expert Panel

Pan Pacific Pressure Injury Alliance - Professional Association

Source(s) of Funding

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Guideline Committee

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Small Working Group (SWG)

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Financial Disclosures/Conflicts of Interest

All guideline developers were required to complete a Conflict of Interest Disclosure form in order to be involved in the guideline development process and to receive acknowledgement as a member of the guideline development team within the guideline. The Guideline Development Group (GDG) and Small Working Group (SWG) members were required to be free of major competing (or conflicting) interests and were requested to disclose the nature of any minor competing interest and recuse themselves from related decisions. Additionally, the SWG members were instructed that appraisal of a study in which he or she was an author or significantly involved in the study undergoing appraisal presents a potential conflict of interest, and other SWG members undertook the appraisal.

See the "Methodology Addendum" companion document for more information on conflict of interest and all disclosures (see the "Availability of Companion Documents" field).

Guideline Status

This is the current release of the guideline.

This guideline updates previous versions: National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel. Pressure ulcer prevention recommendations. In: Prevention and treatment of pressure ulcers: clinical practice guideline. Washington (DC): National Pressure Ulcer Advisory Panel; 2009. p. 21-50. [214 references]

National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel. Pressure ulcer treatment recommendations. In: Prevention and treatment of pressure ulcers: clinical practice guideline. Washington (DC): National Pressure Ulcer Advisory Panel; 2009. p. 51-120. [432 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Electronic copies: Not available at this time.

Print copies: Available for purchase through the International Pressure Ulcer Guideline Web site.

Availability of Companion Documents

The following are available:

- National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and treatment of pressure ulcers: quick reference guide. Emily Haesler (Ed.). Cambridge Media: Perth (Australia); 2014. 75 p. Electronic copies: Available from the International Pressure Ulcer Guideline Web site.
- National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and treatment of pressure ulcers: methodology addendum. Emily Haesler (Ed.). Cambridge Media: Osborne Park (Australia); 2014. 36 p. Electronic copies: Available from the International Pressure Ulcer Guideline Web site.
- Clinical practice guideline for pressure ulcer prevention and treatment. Literature identified in data base searches. 2013 Aug. 166 p. Electronic copies: Available from the International Pressure Ulcer Guideline Web site.
- Prevention and treatment of pressure ulcers: technical documents: critical appraisal tables. 2014. 102 p. Electronic copies: Available from the International Pressure Ulcer Guideline Web site.
- Prevention and treatment of pressure ulcers: technical documents: data extraction tables. 2014. 307 pages. Electronic copies: Available from the International Pressure Ulcer Guideline Web site.
- Coleman S, Gorecki C, Nelson EA, Closs SJ, Defloor T, Halfens R, Farrin A, Brown J, Schoonhoven L, Nixon J. Patient risk factors for pressure ulcer development: systematic review. Int J Nurs Stud. 2013 Jul; 50(7):974-1003. Electronic copies: Available from the International Journal of Nursing Studies Web site.

- Chou R, Dana T, Bougatsos C, Blazina I, Starmer A, Reitel K, Buckley D. Pressure ulcer risk assessment and prevention: comparative effectiveness. Comparative effectiveness review No. 87. (Prepared by Oregon Evidence-based Practice Center under Contract No. 290-2007-10057-I.) AHRQ Publication No. 12(13)-EHC148-EF. Rockville (MD): Agency for Healthcare Research and Quality; 2013 May. 358 p. Electronic copies: Available from the Agency for Healthcare Research and Quality (AHRQ) Web site .

In addition, quality indicators are available in the original guideline document.

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on April 21, 2011. The information was verified by the guideline developer on May 4, 2011. This summary was updated by ECRI Institute on March 6, 2014 following the U.S. Food and Drug Administration advisory on Over-the-Counter Topical Antiseptic Products. This summary was updated by ECRI Institute on February 5, 2015. The updated information was verified by the guideline developer on March 1, 2015.

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