Prevention and Treatment of Pressure Ulcers: *Bariatric Individuals* – an extract from the Clinical Practice Practice Guideline
INTRODUCTION

Foreword

This document presents an extract of the full Clinical Practice Guideline. The methodology used to appraise research and develop the recommendations is presented in the Clinical Practice Guideline, the abridged Quick Reference Guide, and in the methodology report, all available on the International Pressure Ulcer Guideline website (www.internationalguideline.com).

The full Clinical Practice Guideline presents recommendations and summarizes the supporting evidence for pressure ulcer prevention and treatment. The first edition was developed as a four year collaboration between the National Pressure Ulcer Advisory Panel (NPUAP) and the European Pressure Ulcer Advisory Panel (EPUAP). In the second edition of the guideline, the Pan Pacific Pressure Injury Alliance (PPPIA) has joined the NPUAP and EPUAP.

The goal of this international collaboration was to develop evidence-based recommendations for the prevention and treatment of pressure ulcers that could be used by health professionals throughout the world. An explicit scientific methodology was used to identify and critically appraise all available research. In the absence of definitive evidence, expert opinion (often supported by indirect evidence and other guidelines) was used to make recommendations. Drafts of the recommendations and supporting evidence were made available to 986 invited stakeholders (individuals and organizations) around the world. The final guideline is based on available research and the accumulated wisdom of the NPUAP, EPUAP, PPPIA and international stakeholders. In this edition of the guideline, a consensus voting process (GRADE) was used to assign a strength to each recommendation. The strength of recommendation identifies the importance of the recommendation statement based on potential to improve patient outcomes. It provides an indication to the health professional of the confidence one can have that the recommendation will do more good than harm, and can be used to assist in prioritizing pressure ulcer related interventions. Printed copies of the English version of the full Clinical Practice Guideline are available through links provided on the following websites:

NPUAP website: www.npuap.org
EPUAP website: www.epuap.org
Wounds Australia (previously Australian Wound Management Association) website: www.woundsaustralia.com.au
New Zealand Wound Care Society (NZWCS) website: www.nzwcs.org.nz
International Pressure Ulcer Guideline website: www.internationalguideline.com

Suggested Citation

The NPUAP, EPUAP and PPPIA welcome the use and adaptation of this guideline at an international, national and local level. We request citation as the source, using the following format for this extract:

Limitations and Appropriate Use of This Guideline

- Guidelines are systematically developed statements to assist health professional and patient consumer 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 professional with consideration to 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, we do not guarantee the reliability and accuracy of individual studies referenced in this document.
- This guideline is intended for education and information 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 professional is responsible for maintaining a working knowledge of research and technology advances that may affect his or her clinical decision making.
- Generic names of products have been used. Nothing in this guideline is intended as 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.

Abstract

The guideline is the result of a collaborative effort among the National Pressure Ulcer Advisory Panel (NPUAP), European Pressure Ulcer Advisory Panel (EPUAP) and Pan Pacific Pressure Injury Alliance (PPPIA). A comprehensive literature review was conducted on pressure ulcer prevention and treatment. A rigorous scientific methodology was used to appraise available research and make evidence-based recommendations for the prevention and treatment of pressure ulcers. Draft guidelines were made available to 986 invited stakeholder individuals and organizations/societies and stakeholder feedback was considered by the guideline developers. In the final development process, the guideline development team used a consensus voting process (GRADE) to assign strengths of recommendation. Strength of recommendations indicate the extent to which one can be confident that adherence to a recommendation will do more good than harm, and are intended to assist the health professional to prioritize interventions.

The full Clinical Practice Guideline includes 575 explicit recommendations and/or research summaries.

This extract focuses on the evidence presented on prevention and treatment of pressure ulcers in bariatric individuals.
Strengths of Evidence and Strengths of Recommendations

Full explanation of the methodology is available in Appendix 1: Guideline Methodology. Individual studies were assigned a ‘level of evidence’ based on study design and quality. The body of evidence supporting each recommendation was given a ‘strength of evidence’. A consensus voting process (GRADE) involving all the experts formally engaged in the guideline development was used to assign a ‘strength of recommendation’ that indicates the confidence the health professional can have that the recommended practice will improve patient outcomes (i.e., do more good than harm). The overall aim of the ‘strength of recommendation’ is to help health professionals to prioritize interventions.

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Guideline Website

http://www.internationalguideline.com

The guideline website will remain accessible during the interim period until the next guideline revision. The Quick Reference Guideline, sponsor acknowledgement, and supportive documents to the guideline (e.g. data extraction tables) are available from the website.
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Translation

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Stakeholders

Special thanks to the many stakeholders who reviewed the guideline processes and drafts. All stakeholder comments were reviewed by the Guideline Development Group and revisions were made based on the comments received. We appreciate the investment of health professionals, researchers, educators and manufacturers from all over the world who took time to share their expertise and thoughtful critique.
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SPECIAL POPULATIONS

BARIATRIC (OBESE) INDIVIDUALS

Introduction

Obesity has increased dramatically in the last few decades. Currently 65% of the global population live in countries in which being overweight or obese is associated with greater mortality than being underweight. The World Health Organization (WHO) defines overweight and obesity as abnormal or excessive fat accumulation that may impair health.

Obesity is associated with various skin and tissue health problems and diseases; however, precise causal relationships between obesity and pressure ulcer development are unclear. Based on finite element modeling, epidemiological data, and clinical experience, there appears to be a U-shaped relationship between body mass index (BMI) and pressure ulcer occurrence. Both very thin individuals and overweight-to-obese individuals are at higher pressure ulcer risk compared to individuals within a normal BMI range. However, while the association between underweight and increased pressure ulcer risk is established, evidence supporting the relationship with obesity seems to be less clear.

Epidemiological studies have demonstrated strong, weak or no relationship between obesity and pressure ulcers. Compher et al. (2007) conducted a secondary analysis of a cohort study (n = 3214) on risk factors for pressure ulcers and found a reduced odds ratio (OR) for pressure ulcers in obese individuals (adjusted OR = 0.70, 95% confidence interval [CI] 0.40 to 1.0), indicating that obesity might be a protective factor. Possible explanations for these findings are that non-comparable skin areas, non-comparable pressure ulcer Categories/Stages, and use of different BMI cut-offs and categories.

A particular feature of severe obesity is maceration, inflammation, and tissue/skin necrosis, especially in large and deep skin folds. Both an increased tissue weight that exerts additional load on dependent tissues and causes vascular occlusion, and a fragile vascular and lymphatic framework, is responsible for skin and tissue complications.

Pressure ulcer prevention and treatment for the bariatric individual is similar to that for non-bariatric individuals; however, bariatric care is more challenging for a number of reasons. The bariatric individual has increased difficulty moving either independently or with assistance. The increased body weight makes it difficult to view bony prominences and to redistribute pressure. Shear and friction are often increased as the bariatric individual is inclined to drag his or her heels and sacrum when getting out of bed. The increased pressure on the bowel and bladder from abdominal weight increases the risk of stress incontinence and diaphoresis, which increases the risk of skin maceration. Obesity can also compromise respiration due to impaired diaphragmatic movement and subsequent impaired tissue perfusion.

The recommendations below highlight important considerations in the care of bariatric individuals and should be considered in conjunction with the recommendations in the main sections of this guideline.

Recommendations for the Organization

1. Provide safe, respectful care and avoid injuries to both the individual and health professionals. (Strength of Evidence = C; Strength of Recommendation = ⚫⚫)

2. Maximize workplace safety by implementing organization-wide bariatric management strategies that address manual handling techniques. (Strength of Evidence = C; Strength of Recommendation = ⚫⚫)
Health professionals involved in manual handling require appropriate training to avoid injury to both themselves and the individual during repositioning and transfer. Health professionals should be provided with education and training in the correct and safe use of equipment.

3. Provide pressure redistribution support surfaces and equipment appropriate to the size and weight of the individual. (Strength of Evidence = C; Strength of Recommendation = )

Appropriate bariatric equipment is critical in maintaining or re-establishing mobility for bariatric individuals to address the primary risk factor for pressure ulcer development (i.e., immobility). Evaluate the safe working load, width and capacity of the equipment (e.g., beds, chairs, toilets, bed pans, mattress, wheelchair, walkers, scales and lifts) to ensure it meets the needs of the individual and the care environment. Procure an appropriate range of bariatric equipment.

Assessing the Bariatric Individual

1. Calculate BMI and classify obesity. (Strength of Evidence = C; Strength of Recommendation = )

Three classifications of overweight severity are identified:2
• obese I: BMI 30.0 to 34.9 kg/m²
• obese II: BMI of 35.0 to 39.9 kg/m²
• obese III: BMI ≥ 40.0 kg/m².

Body mass index, an index of an individual’s weight in relationship to height, is calculated as:

\[
\text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}^2} \quad \text{or} \quad \frac{\text{weight (lb)}}{\text{height (in)}^2} \times 703
\]

To obtain an accurate standing height the individual should be measured without shoes and standing erect with the measuring scale placed flat on the head. Reclining heights can be taken when the individual is lying flat with one arm extended straight out in a 90° angle to the torso. A tape measure is used to measure from the middle of the sternum to the tip of the middle finger. The obtained measurement is doubled and documented as an approximate height.12 Weigh an individual on a calibrated scale at the same time of the day, in light clothing, without shoes, after voiding, and without a catheter bag. Prosthetic devices should be removed prior to weighing, or weigh the devices and subtract the weight from the total weight.

While BMI is the same for all ages and both sexes amongst adults, it does have limitations. Very muscular individuals may fall into the overweight category when they are actually healthy and physically fit. The frail, elderly individual may fit into a normal range when in reality they have lost muscle mass.

Computing percentage of body fat using skinfold thickness measurements with calipers is more precise and is an inexpensive method. Other methods used to measure body fat include underwater weighing, bioelectrical impedance, dual-energy x-ray absorptiometry (DXA), and isotope dilution. However, these methods are expensive and require trained personnel and special equipment. Despite the limitations, BMI is the most common method used to classify obesity.

2. Assess all skin folds regularly. (Strength of Evidence = C; Strength of Recommendation = )

2.1. Access adequate assistance to fully inspect all skin surfaces and folds. (Strength of Evidence = C; Strength of Recommendation = )

An assessment should be conducted on admission and regularly thereafter. Pay particular attention to skin folds in the following areas:
• behind the neck,
• mid back region,
• under the arms and breasts,
• under the abdomen or pannus,
• upper and lower thighs,
• perineal, buttock and sacral area, and
• calves, heels and ankles.

Pressure ulcers develop over bony prominences, but may also result from tissue pressure across the buttocks and other areas of high adipose tissue concentration. Pressure ulcers may develop in unique locations, such as underneath folds of skin and in locations where tubes and other devices have been compressed between skin folds. The combination of moisture trapped under skin folds, pressure of skin folds on the underlying skin, and friction and shear between the skin surfaces are all factors that contribute to pressure ulcer formation underneath folds of skin.

The weight of the pannus (the abdominal fat and the skin fold apron) can cause pressure ulcers to develop in areas such as the hip, pubis, thighs, trunk and torso. Assessing these areas should be part of the ongoing skin assessment for the bariatric individual.

Check skin for signs of maceration, which is a common occurrence for the bariatric individual due to increased diaphoresis. Check for damage to the skin from the impact and force of excessive friction and shear.

2.2. Differentiate intertriginous dermatitis from Category/Stage I and II pressure ulcers. (Strength of Evidence = C; Strength of Recommendation = )

Obese individuals are at higher risk for intertriginous dermatitis because their multiple skin folds form ideal conditions for inflammation and maceration. It is important to differentiate intertrigo from Category/Stage I and II pressure ulcers based on etiology and skin appearance. In the obese individual, the most common areas in which intertrigo develops include under the pannus, the breasts, and in the groin or perineum.

3. Refer bariatric individuals to a registered dietitian or an interprofessional nutrition team for a comprehensive nutrition assessment and weight management plan. (Strength of Evidence = C; Strength of Recommendation = )

All bariatric individuals are at nutritional risk. The bariatric individual can be malnourished despite the appearance of being well fed. Under the direction of the interprofessional nutrition team, balance weight loss with providing adequate nutrients to prevent pressure ulcers in at risk bariatric individuals and to support healing in those with existing ulcers.

Bed Selection

1. Ensure the individual is provided with a bed of appropriate size and weight capacity specifications. (Strength of Evidence = C; Strength of Recommendation = )

1.1. Use beds that adequately support the weight of the individual. (Strength of Evidence = C; Strength of Recommendation = )

Bariatric individuals may exceed the weight and width capacity of standard pressure redistribution support surfaces and require appropriate equipment designed to accommodate their increased girth and weight.

1.2. Check routinely for ‘bottoming out’ of the support surface. (Strength of Evidence = C; Strength of Recommendation = )

The bariatric individual may cause the mattress to sink or ‘bottom out’.
1.3. Ensure that the bed surface area is sufficiently wide to allow turning of the individual without contact with the side rails of the bed. (Strength of Evidence = C; Strength of Recommendation =  )

Standard beds are 32 to 36 inches (81 to 91 cm) in width. Individuals who fill the width of the bed may be restricted in their ability to turn side-to-side or into positions that offload the sacral area.

2. Consider selecting a support surface with enhanced pressure redistribution, shear reduction and microclimate control for bariatric individuals. (Strength of Evidence = C; Strength of Recommendation =  )

The bariatric individual often experiences increased shear and friction with movement, and increased difficulty in redistributing pressure. The bariatric individual is also at increased risk of stress incontinence and diaphoresis. A support surface that optimizes pressure redistribution and microclimate control is required.

In a small observational study (n = 21), Pemberton et al. (2009)\(^\text{15}\) provided a low-air loss, continuous lateral rotation bed with advanced microclimate technology to bariatric individuals (BMI > 35 kg/m\(^2\), mean BMI was 51.4 ± 10.3 kg/m\(^2\)) with pressure ulcers. The individuals spent an average of 4.8 ± 2.5 days (range two to eight days) on the specialized support surface. Over the study period no new pressure ulcers developed, and existing pressure ulcers decreased from an average size of 5.2 ± 2.6 cm\(^2\) to an average size of 2.6 ± 5.0 cm\(^2\) (p = not reported). Mean participant comfort rating for the surface was 3.9 out of 4 (Level 5 study).

The Support Surfaces section of the guideline has further information on support surface features.

**Equipment Selection**

1. Use wheelchairs and chairs that are wide and strong enough to accommodate the individual’s girth and weight. (Strength of Evidence = C; Strength of Recommendation =  )

1.1. Use a pressure redistribution cushion designed for the bariatric individual on seated surfaces. (Strength of Evidence = C; Strength of Recommendation =  )

Biomechanical modeling studies suggest an increased risk of suspected deep tissue injury in the seated bariatric individual. In a biomechanical modeling investigation, Elsner et al. (2008)\(^\text{16}\) used finite element models to demonstrate that a higher BMI is associated with an increase in internal muscle tissue load under the ischial tuberosities. Sopher et al. (2010)\(^\text{4}\) continued this investigation using finite element models representing the same individual modeled with BMIs ranging from less than 16.5 kg/m\(^2\) up to 40 kg/m\(^2\). The study results showed that the percentage volume of muscle tissue under the ischial tuberosities increased over five times as BMI increased from 19 kg/m\(^2\) to 40 kg/m\(^2\). In a study by Elsner et al. (2008)\(^\text{16}\) increases on internal muscle load were of a greater magnitude in modeling of sitting on a hard surface compared with a soft chair (indirect evidence).

1.2 Check routinely for ‘bottoming out’ of the cushion. (Strength of Evidence = C; Strength of Recommendation =  )

The Support Surfaces section of the full Clinical Practice Guideline has further information on support surface features.

2. Where appropriate, provide bariatric walkers, overhead trapezes on beds, and other devices to support continued mobility and independence. (Strength of Evidence = C; Strength of Recommendation =    )
Repositioning

1. **Avoid pressure on skin from tubes, other medical devices and foreign objects.** (Strength of Evidence = C; Strength of Recommendation = ¶¶)

2. **Use pillows or other positioning devices to offload the pannus or other large skin folds and prevent skin-on-skin pressure.** (Strength of Evidence = C; Strength of Recommendation = ¶)

3. **Check the bed for foreign objects.** (Strength of Evidence = C; Strength of Recommendation = ¶)

Foreign objects, including phones, remote controls, and eating utensils, may become lodged under the individual. These objects cause local loads and tissue deformation that contribute to skin breaking down to pressure ulcers.

Pressure Ulcer Care

1. **Provide adequate nutrition to support healing.** (Strength of Evidence = C; Strength of Recommendation = ¶¶)

Bariatric individuals, despite their size, may lack adequate nutrients to support healing of pressure ulcers. Goals of weight loss may need to be postponed or modified to ensure that adequate nutrients are provided for healing (see *Nutrition for Prevention and Treatment of Pressure Ulcers* section of the full Clinical Practice Guideline).

2. **Assess pressure ulcers carefully for signs of infection and delays in healing.** (Strength of Evidence = C; Strength of Recommendation = ¶¶)

Infection and delayed healing are more common in bariatric individuals. The *Assessment and Treatment of Infection and Biofilms* section of the full Clinical Practice Guideline provides comprehensive recommendations on managing wound infection.

3. **Monitor wound dressing materials closely, especially in large cavity wounds.** (Strength of Evidence = C; Strength of Recommendation = ¶¶)

Additional skin folds and deeper tissue layers can impede assessment of cavity wounds and increase the risk of retained wound dressing materials. Fill cavity wounds with dressing materials carefully to reduce the risk of losing dressings in the wound. Document the number of dressings used to fill large wounds, and ensure that all dressings are removed at the next dressing change. The *Wound Dressings* section of the full Clinical Practice Guideline provides further guidance on selection and use of wound dressings.

References


GLOSSARY OF TERMS – BARIATRIC INDIVIDUALS EXTRACT

**Body mass index (BMI):** Defined as an individual’s weight in kilograms divided by the square of his height in meters. The term bariatric, derived from the Greek word *baros* meaning heavy and iatriic relating to the medical treatment of this condition, is used to refer to individuals with a BMI > 30 kg/m².

**Bony prominence:** A bony elevation or projection on an anatomical structure.

**Bottoming out:** Occurs when a reactive or an active support surface provides insufficient support to adequately redistribute pressure due to excessive immersion. The individual presents as sitting or lying on the underlying structure of the bed or chair.

**Eschar:** Black or brown necrotic, devitalized tissue. The tissue can be loose or firmly adherent and hard, soft, or somewhat soggy.

**Friction (frictional force):** The resistance to motion in a parallel direction relative to the common boundary of two surfaces, e.g., when skin is dragged across a coarse surface, such as bed linens.

**Intertrigo:** An erythematous skin eruption that occurs on opposing surfaces of skin (e.g., the creases of the neck, folds of the groin and armpit, or beneath pendulous breasts) from moisture, warmth, friction, and/or infectious agents. It occurs more commonly in bariatric individuals.

**Microclimate:** The local tissue temperature and moisture (relative humidity) level at the body/support surface interface.

**Mobility:** The ability to move oneself from one position to another.

**Necrosis:** The death of tissue.

**Necrotic tissue:** Tissue that has died, also called devitalized or non-viable tissue.

**Offload:** To remove pressure from any area.

**Pannus:** A hanging flap of tissue; abdominal tissue in a bariatric individual.

**Pressure:** Normal force per unit surface area.

**Pressure injury:** see *Pressure ulcer*.

**Pressure ulcer (pressure injury):** A localized injury to the skin and/or underlying tissue, usually over a bony prominence, as a result of pressure or pressure in combination with shear. A number of contributing or confounding factors are also associated with pressure ulcers; the significance of these factors has yet to be elucidated. (See the Etiology of Pressure Ulcers section of the guideline). Previously referred to as decubitus ulcer, bedsore and pressure sore.

**Reposition:** A change in position in the lying or seated individual, with the purpose of relieving or redistributing pressure and enhancing comfort, undertaken at regular intervals.

**Standard (usual) care:** A term most often used in research studies to describe usual care delivered within a facility that is often the comparator intervention when pressure ulcer prevention interventions are being investigated. Standard care varies according to the setting and historical context. Within the context of this guideline, a description of the standard care is provided when available.

**Standard hospital mattress:** A term used to describe the standard mattress provided within a facility and generally used as the comparative intervention in research trials investigating the effectiveness of pressure redistribution support surfaces. As such, the qualities of a standard hospital mattress vary according to historical and clinical context and are rarely reported in detail in clinical trials. In most cases it is assumed that
a standard hospital mattress is a non-powered foam or spring-based mattress.

**Support surface:** A specialized device for pressure redistribution designed for management of tissue loads, microclimate, and/or other therapeutic functions. Support surfaces include but are not limited to mattresses, integrated bed systems, mattress replacements or overlays, or seat cushions and seat cushion overlays.

**Support surfaces: physical concepts:**

- **Active support surface:** A powered support surface that produces alternating pressure through mechanical means and has the ability to change its load distribution properties with or without an applied load.²

- **Coefficient of friction:** A measurement of the amount of friction existing between two surfaces.³

- **Envelopment:** The ability of a support surface to conform to irregularities in the body.³⁻⁵

- **Fatigue:** The reduced capacity of a surface or its components to perform as specified. This change may be the result of intended or unintended use and/or prolonged exposure to chemical, thermal, or physical forces.³

- **Force:** A push/pull vector with magnitude (quantity) and direction (pressure and shear) that is capable of maintaining or altering the position of a body.³⁻⁶

- **Friction (frictional force):** The resistance to motion in a parallel direction relative to the common boundary of two surfaces.³

- **Immersion:** The depth of penetration (sinking) into a support surface.³⁻⁵

- **Life expectancy:** The defined period of time during which a product is expected to effectively fulfill its designated purpose.³

- **Mechanical load:** The force distribution acting on a surface.³

- **Pressure:** The force per unit area exerted perpendicular to the plane of interest.³

- **Pressure redistribution:** The ability of a support surface on which an individual is placed to distribute load over the contact areas of the human body, thereby reducing the load on areas in contact with the support surface. This term replaces prior terminology of pressure reduction and pressure relief surfaces.³

- **Pressure relief:** see *Pressure redistribution*.

- **Reactive support surface:** A powered or non-powered support surface with the ability to change its load distribution properties only in response to applied load.³⁻⁷⁻⁸

- **Shear (shear stress):** The force per unit area exerted parallel to the plane of interest.³⁻⁶

- **Shear strain:** The distortion or deformation of tissue as a result of shear stress.³⁻⁶⁻⁹

**Support surfaces: components:** The components of any support surface described below may be used alone or in combination.

- **Air:** A low-density fluid with minimal resistance to flow.³

- **Cell/bladder:** A means of encapsulating a support medium.³

- **Closed-cell foam:** A non-permeable structure in which there is a barrier between cells, preventing gases or liquids from passing through the foam.³
**Elastic foam:** A type of porous polymer material that conforms in proportion to the applied weight. Air enters and exits the foam cells more rapidly due to greater density (non-memory).\(^2,^5\)

**Elastomer:** Any material that can be repeatedly stretched to at least twice its original length. Upon release, the stretch will return to approximately its original length.\(^3\)

**Gel:** A semi-solid system of a network of solid aggregates, colloidal dispersions, or polymers, which may exhibit elastic properties. Gels can range from hard to soft.\(^3\)

**Open cell foam:** A permeable structure in which there is no barrier between cells, and gases or liquids can pass through the foam.\(^3\)

**Pad:** A cushion-like mass of soft material used for comfort, protection, or positioning.\(^3\)

**Solid:** A substance that does not flow perceptibly under stress. Under ordinary conditions, it retains its size and shape.\(^3\)

**Viscoelastic foam:** A type of porous polymer material that conforms in proportion to the applied weight. The air enters the foam cells slowly, which allows the material to respond more slowly than a standard elastic (memory) foam.\(^3,^10\)

**Viscous fluid:** A fluid with a relatively high resistance to flow of the fluid.\(^3\)

**Water:** A moderate density fluid with moderate resistance to flow.\(^3\)

**Support surface features:** A feature is a functional component of a support surface that can be used alone or in combination with other features.

- **Air fluidized:** A feature that provides pressure redistribution via a fluid-like medium created by forcing air through beads, as characterized by immersion and envelopment.\(^3\)

- **Alternating pressure:** A feature that provides pressure redistribution via cyclic changes in loading and unloading, as characterized by frequency, duration, amplitude, and rate of change parameters.\(^3\)

- **Lateral rotation:** A feature that provides rotation about a longitudinal axis, as characterized by degree of turn, duration, and frequency.\(^3\)

- **Low air loss:** A feature that provides a flow of air to assist in managing the heat and humidity (microclimate) of the skin.\(^3,^9\)

- **Multi-zoned surface:** A surface in which different segments can have different pressure redistribution capabilities.\(^3\)

- **Zone:** A segment with a single pressure redistribution capability.\(^3\)

**Support surface categories:**

- **Active support surface:** A powered support surface with the capability to change its load distribution properties, with or without applied load.

- **Integrated bed system:** A bed frame and support surface that are combined into a single unit, whereby the surface is unable to function separately.

- **Mattress:** A support surface designed to be placed directly on the existing bed frame.

- **Non-powered:** Any support surface that does not use external sources of energy, either electric or battery, for operation.

- **Overlay:** An additional support surface designed to be placed directly on top of an existing surface.\(^3\)
**Powered:** Any support surface requiring or using external sources of energy to operate, either electric or battery.\(^3\)

**Reactive support surface:** A powered or non-powered support surface with the capability to change its load distribution properties only in response to applied load.\(^3\)

**Transfer aid:** Any agent that aids in transferring an individual (e.g. a sheet, mechanical lift).

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

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

**References**
