Prevention and Treatment of Pressure Ulcers: Classification, Assessment and Monitoring – an extract from the Clinical 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 classification of pressure ulcers, and includes evidence on assessment and monitoring pressure ulcers.
Strengths of Evidence and Strengths of Recommendations

Full explanation of the methodology is available in Appendix 1: Guideline Methodology of the full Clinical Practice Guideline. 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 (e.g., data extraction tables) to the guideline are available from the website.
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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.
INTRODUCTION

SPONSOR ACKNOWLEDGEMENTS

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TREATMENT OF PRESSURE ULCERS

CLASSIFICATION OF PRESSURE ULCERS

Introduction

A pressure ulcer classification system is used to aid in the description of the extent of skin and tissue damage presenting as a pressure ulcer. Numerous classification systems have been developed and used over the years, informed by evolving understanding of the etiology of pressure ulcers; anatomical knowledge of skin, tissue and muscle layers; and diagnostic and assessment technology. The use of a reliable classification system:

- improves communication between health professionals,
- contributes to the development of an appropriate pressure ulcer prevention plan, including allocation of pressure redistribution support surfaces;
- informs the selection of pressure ulcer treatments;
- allows for comparison of data between institutions; and
- improves the methodological quality of pressure ulcer research.

Differential Diagnosis

1. Differentiate pressure ulcers from other types of wounds. (Strength of Evidence = C; Strength of Recommendation = )

Open wounds from various etiologies (e.g., venous ulcers, neuropathic ulcers, incontinence associated dermatitis, skin tears and intertrigo) may appear similar to a pressure ulcer; however, the treatment of any wound begins with comprehension of its etiology.

Hart et al. (2006)¹ reported on a study of the accuracy of nurses’ assessments of pressure ulcers and other ulcers. The most difficult aspect of the classification was in the etiologies of other ulcers (e.g., neuropathic, venous, arterial and incontinence-associated dermatitis). Accuracy and reliability is reported to be low for nurses attempting to distinguish incontinence-associated dermatitis or moisture lesions from Category/Stage II pressure ulcers.² ³

These findings were supported in an online survey conducted by Mahoney et al. (2011)⁴ In this study, nurses with wound certification (n = 100) classified nine photographs of gluteal cleft and buttock wounds. Presented photographs consisted of pressure ulcers, moisture lesions, incontinence-associated dermatitis and skin tears. There was an overall lack of consensus amongst nurses in identifying wound etiology (κ = 0.1708, 99% confidence interval [CI] 0.163 to 0.1786). (Level 4 study).

Pressure Ulcer Classification Systems

1. Use the International NPUAP/EPUAP Pressure Ulcer Classification System to classify and document the level of tissue loss. (Strength of Evidence = C; Strength of Recommendation = )

Review the Guideline Development Group statement on the 2016 release of the NPUAP Pressure Injury Staging System at: http://internationalguideline.com/statements#staging_system_revision

Access Pressure Ulcer Classification Systems at: http://internationalguideline.com/statements#staging_system_revision

This recommendation is based on expert opinion. Pressure ulcers are classified according to the amount of visible tissue loss. The EPUAP and NPUAP pressure ulcer classification systems are the most commonly used systems. In 2009, these two systems were amalgamated to create the International NPUAP/EPUAP Pressure Ulcer Classification System published in this guideline.
Little comparative data exists on the accuracy of different pressure ulcer classification systems. Generally a specific health care system tends to use a single pressure ulcer classification system. Russell et al. (2001)\textsuperscript{5} examined the accuracy and precision of diagnostic labeling of ulcers, comparing health professionals’ level of training and accuracy using two staging systems (the EPUAP system and the full four digit Stirling classification tool). Lower levels of disagreement occurred when the EPUAP system was used (Level 3 study).

Pressure ulcer classification is based on the visual or palpatory identification of tissues including skin, subcutaneous fat, bone, muscle, tendon, and ligament. Necrotic tissue (slough and eschar) appears in full-thickness pressure ulcers. Granulation tissue becomes present as full-thickness ulcers heal. In contrast, Category/Stage II pressure ulcers do not have necrotic tissue and heal with epithelialization rather than granulation tissue. Healing tissues include scar, granulation tissue, and epithelium.

Pressure ulcer depth varies by anatomical site, and relying on depth alone to determine whether an ulcer is Category/Stage III or IV can be misleading. In body areas with little adipose tissue, such as the bridge of the nose, the occiput, behind the ear, the sacrum, and the malleolus, shallow ulcers can be Category/Stage IV pressure ulcers. In contrast, in body areas with greater adipose tissue, such as the buttocks and ischium, a pressure ulcer may be deep but not reach the muscle or bone, and therefore would remain a Category/Stage III pressure ulcer.

The description of a pressure ulcer should be supplemented with other findings. Indicating the exact location of the pressure ulcer is important, making clear reference to bony prominences if the pressure ulcer is over a bony prominence. Historical information, such as the conditions under which the ulcer began, the history of prior treatment, and the trajectory of healing or non-healing of the ulcer (if known) should be communicated and documented. Such information helps health professionals to evaluate the effectiveness of later treatments.

2. Rely on assessment of skin temperature, change in tissue consistency and pain rather than identification of nonblanchable erythema when classifying Category/Stage I pressure ulcers and suspected deep tissue injury in individuals with darkly pigmented skin. (Strength of Evidence = C; Strength of Recommendation = \(\star\))

Category/Stage I pressure ulcers and suspected deep tissue injury (SDTI) may be difficult to detect with visual inspection alone in dark skinned individuals.

A higher proportion of full-thickness ulcers in dark skinned individuals suggests that detection and treatment are delayed until full-thickness injury is apparent. Vangilder, McFarlane and Meyer\textsuperscript{6} reported on an international pressure ulcer prevalence study that included data on ulcer categories and skin tones (light, medium, and dark). The number of Category/Stage I pressure ulcers was proportionately lower in individuals with dark skin tones (13%) in comparison to those with medium skin tones (32%) and light skin tones (38%). Category/Stage III and IV pressure ulcers were found at proportionately higher rates in individuals with darker skin pigmentation. There was little difference in the percent of Category/Stage II pressure ulcers by skin tone: 36.8% for light tones, 39.3% for medium tones and 41.3% in those with dark toned skin. However, there was a greater percent of Category/Stage III and IV pressure ulcers in individuals with dark skin tone: 6.2% of light toned subjects and 6.7% of those with medium toned skin had Category/Stage III ulcers, compared to 10.8% of individuals with dark skin tones. A similar pattern is seen in Category/Stage IV pressure ulcers: 5.5% of light toned subjects, 6.8% of those with medium skin tones and 12.9% of those with dark toned skin (Level 4 study). This pattern is a recurrent trend in pressure ulcer prevalence and incidence studies.\textsuperscript{7-11} Astute assessment of intact skin in dark skinned individuals is critical in reversing this trend.

In a study of 1,938 residents of 59 nursing homes, Baumgarten et al. (2004)\textsuperscript{12} reported a significantly higher rate of Category/Stage II to IV pressure ulcers for residents with dark skin tones (0.56 ulcers per person year) compared with residents with light skin tones (0.35 ulcers per person year) (\(p < 0.001\)). Race was significantly associated with pressure ulcer development in a multivariate analysis that also
considered resident and facility characteristics (Level 4 study). Rosen et al. (2006)\textsuperscript{3} found similar disparities between dark and light skin toned nursing home residents at the beginning of a quality improvement program. Staff education and incentives eliminated the racial disparities noted at baseline (Level 3 study).

3. **Assess skin heat, tenderness, change in tissue consistency and pain to assist in identifying the severity of Category/Stage II to IV and unstageable pressure ulcers in individuals with darkly pigmented skin.** (Strength of Evidence = C; Strength of Recommendation = \(\otimes\))

This recommendation is based on expert opinion. Just as Category/Stage I pressure ulcers and deep tissue injury in intact skin may go undetected in dark skinned individuals,\textsuperscript{6-13} the full extent and severity of open pressure ulcers may be overlooked without a full assessment of the surrounding skin. Inflammatory redness from cellulitis and deeper tissue damage may be difficult to detect in individuals with darkly pigmented skin, therefore diagnosis of cellulitis and/or identification of undermining may be delayed or missed. Assess skin heat, pain or change in tissue consistency to identify the extent of inflammation and possible cellulitis and/or undermining in Category/Stage II, III, IV and unstageable pressure ulcers.

Evidence suggests that individuals with Category/Stage IV pressure ulcers experience more pain than individuals with lower Category/Stage ulcers.\textsuperscript{14-16}

4. **Use the International NPUAP/EPUAP Pressure Ulcer Classification System to classify and document the level of tissue loss in medical device related pressure ulcers.** (Strength of Evidence = C; Strength of Recommendation = \(\otimes\))

*Review the Guideline Development Group statement on the 2016 release of the NPUAP Pressure Injury Staging System at: http://internationalguideline.com/statements#staging_system_revision*

*Access Pressure Ulcer Classification Systems at: http://internationalguideline.com/statements#staging_system_revision*

This recommendation is based on expert opinion. Medical device related pressure ulcers are pressure ulcers that result from the use of devices designed and applied for diagnostic or therapeutic purposes. The resultant pressure ulcer generally closely conforms to the pattern or shape of the device.\textsuperscript{17}

Medical device related pressure ulcers should be classified according to the amount of visible tissue loss using the International NPUAP/EPUAP Pressure Ulcer Classification System, as for most other pressure ulcers.

5. **Do not use the International NPUAP/EPUAP Pressure Ulcer Classification System to describe tissue loss in wounds other than pressure ulcers.** (Strength of Evidence = C; Strength of Recommendation = \(\otimes\))

This recommendation is based on expert opinion. Pressure ulcer classification systems should only be used to document tissue loss in ulcers resulting from pressure or pressure in combination with shear. Other staging systems exist that can be used to describe venous ulcers, diabetic (neuropathic) ulcers and skin tears.

6. **Do not categorize/stage pressure ulcers on mucous membranes.** (Strength of Evidence = C; Strength of Recommendation = \(\otimes\))

This recommendation is based on expert opinion. Mucosal pressure ulcers are pressure ulcers found on mucous membranes with a history of medical device use at the location of the ulcer. Where pressure is a significant factor in the etiology of the wound, it should still be considered to be a pressure ulcer; however, it is inappropriate to use a pressure ulcer classification system to categorize/stage the ulcer.
Mucous membrane is the moist lining of body cavities that communicates with the exterior. These tissues line the tongue, gastrointestinal tract, nasal passages, urinary tract and vaginal tract. Pressure applied to this tissue can render it ischemic and lead to ulceration. Mucosal tissues are especially vulnerable to pressure from medical devices, such as oxygen tubing, endotracheal tubes, bite blocks, orogastric and nasogastric tubes, urinary catheters, and fecal containment devices.

The classification system for pressure ulcers of the skin cannot be used to categorize mucosal pressure ulcers. Nonblanchable erythema cannot be seen in mucous membranes, shallow open ulcers indicating superficial tissue loss of the non-keratinized epithelium are so shallow that the naked eye cannot distinguish them from deeper, full-thickness ulcers. Soft coagulum seen in mucosal pressure ulcers, which looks like slough often present in Category/Stage III pressure ulcers, is actually soft blood clot. Exposed muscle would seldom be seen, and bone is not present in these soft tissues.

7. **Verify that there is clinical agreement in pressure ulcer classification amongst the health professionals responsible for classifying pressure ulcers. (Strength of Evidence = B; Strength of Recommendation = ⊗)**

A number of published studies have examined the clinical agreement in pressure ulcer identification and categorization/staging. These studies have either compared bedside evaluations of wounds or evaluated assessments of wounds from photographs. Nixon et al. (2005)\textsuperscript{18} reported on a study of pressure ulcer assessment between general registered nurses and wound nurses. In addition to the usual categories/stages of pressure ulcers, a classification for blanching or nonblanching was also included. Interrater reliability was high; there were 21% disagreements, and 82% of those disagreements fell within one Category/Stage (Level 3 study).

Bours et al. (1999)\textsuperscript{19} compared nurses’ and wound care experts’ bedside assessments of pressure ulcer classification in a variety of healthcare settings. The nurses in the hospital (674 observations on 45 individuals) and nursing home (344 observations on 23 individuals) had near perfect interrater reliability ($\kappa = 0.97$ and $\kappa = 0.81$), but interrater reliability was lower in the home care setting (1,348 observations on 90 individuals, $\kappa = 0.49$) In all three settings, less than 1% of the observations resulted in classification as a Category/Stage III or IV pressure ulcer, and the vast majority (up to 97%) in each health care setting identified no pressure ulcer present. Most disagreement was between no pressure ulcer present and Category/Stage I pressure ulcer present (Level 3 study).

Use of photographs is a common method of teaching and testing knowledge of different Categories/Stages of pressure ulcer. Defloor and Schoonhoven\textsuperscript{2,3} examined the interrater reliability of pressure ulcer identification and staging performed by 44 pressure ulcer experts. Photographs of 48 pressure ulcers, along with photographs of eight incontinence-associated dermatitis sites (also reported as moisture lesions), were assessed. Kappa ($\kappa$) values ranged from 0.64 to 0.75, indicating moderate to substantial agreement in pressure ulcer identification and category/staging between pressure ulcer expert raters. Incontinence as an etiology of pressure ulcers was a common area of misclassification (Level 3 study).

Bergquist-Beringer et al. (2011)\textsuperscript{20} investigated interrater reliability of classification performed by direct observation and by reviewing photographs. Participants ($n = 180$) performed their direct observation classifications in teams, all observing the individual pressure ulcer ($n = 591$) at the same time but remaining blind to other team members’ classifications. After the direct observation phase, participants performed web-based classification of photographs, with half the participants randomized to receive a short description of the wound alongside the photograph, and the other half receiving only the photograph. Interrater reliability was moderate for classification using direct observation. For Category/Stage I to IV pressure ulcers $\kappa$ was 0.60 and for classification of Category/Stage II to IV and unstageable pressure ulcers $\kappa$ was 0.61. Interrater reliability was slightly better for classification via photographs ($\kappa = 0.69$) (Level 2 study).
In a study that included individuals with both light (n = 28) and darker (n = 20) skin tones, Baumgarten et al. (2009)\(^2^1\) compared real time clinical assessment performed by a wound care specialist with digital photography assessed by blinded dermatologists and wound care specialists as strategies to classify pressure ulcers. Digital photography had an overall high sensitivity (97%) for classifying pressure ulcers of Category/Stage II or greater, with slightly lower sensitivity in individuals with darker skin tones (93%) (Level 3 study).

In a cross-sectional study conducted by Bååth et al. (2008)\(^2^2\) the interrater reliability of pressure ulcer classifications performed using the Pressure Ulcer Card (PUC) was investigated. The PUC included descriptions and color illustrations of pressure ulcer categorized into four Classifications/Stages (an additional Classification/Stage was also added for intact skin). Registered nurses (RNs) and enrolled nurses (ENs) performed skin assessments as a team, each conducting an independent assessment within one hour of each other. A second team performed an additional assessment within two hours of the first assessment. Interrater reliability was moderate among the RNs (n = 114 assessments, \(\kappa = 0.364\) to 0.637 by anatomical location), moderate among the ENs (n = 114 assessments, \(\kappa = 0.322\) to 0.607 by anatomical location) and moderate between the RNs and the ENs (n = 228 assessments, \(\kappa = 0.394\) to 0.755 by anatomical location). Interrater reliability was highest for assessment of the sacral region. The study did not report the outcome of Category/Staging assessments, but implied that the majority of assessments identified intact skin of Category/Stage I pressure ulcers (Level 4 study). Higher levels of education and training in wound care are generally associated with more accurate assessments of the Category/Stage. Briggs (2006)\(^2^3\) conducted a pre- and post-test study in pressure ulcer classification. The study concluded that the level of accuracy of pressure ulcer classification was poor pre-test but markedly improved post-test (Level 3 study). Young et al. (2011)\(^2^4\) also found that classification using a clinical decision tool to assist clinical decision making improved following education for both health professional (correct responses pre-education 63.5% versus 70.7% post-education) and for students (52.3% versus 67%) (Level 3 study).

Hart et al. (2006)\(^1\) found that accuracy of nurses without training in wound care could reach that of wound nurses if the wound descriptions were included along with the photographs. However, in study by Young et al. (2011)\(^2^4\) classifications performed by students did not reach the accuracy of those performed by health professionals when using a tool that included both descriptions and indicative photographs (Level 3 study). In the study by Bergquist-Beringer et al. (2011)\(^2^0\), there was much stronger interrater reliability for classification using photographs when a short description was included (\(\kappa = 0.81\)) compared with providing the photograph only (\(\kappa = 0.59\)). When provided with a decision tree to classify three pressure ulcers and choose treatments, the accuracy of classification did not improve, but the choice of dressings did\(^2^5\) (Level 3 study).

Sarhan (2010)\(^2^6\) also found high interrater agreement between nurses (n = 10) using good quality images to classify pressure ulcers in individuals with spinal cord injury. There was 100% agreement in classification using the EPUAP framework for Category/Stage I and II pressure ulcers and 77% agreement for Category/Stage IV pressure ulcers (Level 4 study).

Two recent studies\(^2^4, 2^7\) explored the use of digital clinical decision support systems that can be used by the health professional as an aid to classifying pressure ulcers.

The small study by Alvey et al. (2012)\(^2^7\) had methodological limitations and failure of the digital system to operate as expected during the study indicated that the system requires improvements before it could be adopted in clinical practice. Young et al. (2011)\(^2^4\) investigated the intrarater reliability of the N.E. One Can Stage digital system that was designed to assist in accurate category/staging conducted by both health professionals and students (n = 101). The tool includes descriptions of pressure ulcer Categories/Stages, indicative photographs and a measurement scale that can be used to calculate the wound margins of a photographed pressure ulcer. In this study, participants identified and then classified photographs of eight pressure ulcers and two other wound types. Participants repeated the assessment four times, each with varying levels of education on pressure ulcer classification and tool use. There was substantial reliability between tests three and four (intraclass coefficient [ICC] = 0.794,
95% CI 0.697 to 0.862). Although the intrarater reliability was substantial, the study did not investigate use of the tool as it was intended, i.e., health professionals were presented with photographs rather than taking photographs of pressure ulcers and aligning them correctly with the in-built measurement tool. This tool has been updated since the study was published (now called NE1 Wound Assessment Tool) (Level 3 study).

References


ASSESSMENT OF PRESSURE ULCERS AND MONITORING OF HEALING

Introduction

Comprehensive assessment of the individual and his or her pressure ulcer informs development of the most appropriate management plan and ongoing monitoring of wound healing. Effective assessment and monitoring of wound healing is based on scientific principles, as described in this section of the guideline.

Assessment of the Individual with a Pressure Ulcer

1. Complete a comprehensive initial assessment of the individual with a pressure ulcer. An initial assessment includes:
   - Values and goals of care of the individual and/or the individual’s significant others.
   - A complete health/medical and social history.
   - A focused physical examination that includes:
     - factors that may affect healing (e.g., impaired perfusion, impaired sensation, systemic infection);
     - vascular assessment in the case of extremity ulcers (e.g., physical examination, history of claudication, and ankle-brachial index or toe pressure); and
     - laboratory tests and x-rays as needed.
   - Nutrition.
   - Pain related to pressure ulcers.
   - Risk for developing additional pressure ulcers.
   - Psychological health, behavior, and cognition.
   - Social and financial support systems.
   - Functional capacity, particularly in regard to repositioning, posture and the need for assistive equipment and personnel.
   - The employment of pressure relieving and redistributing maneuvers.
   - Resources available to the individual (e.g. pressure redistribution support surfaces).
   - Knowledge and belief about prevention and treatment of pressure ulcers.
   - Ability to adhere to a prevention and management plan. (Strength of Evidence = C; Strength of Recommendation = \( \text{Weak} \))

Assessment of the individual, his or her ability to heal, the risk for development of additional pressure ulcers, and the ulcer itself are important. An assessment of the individual should include any co-morbid health problems, including combination(s) of problems; medications; nutritional status; risk factors, including immobility and incontinence; diagnostic test results; psychosocial implications; and wishes, goals and concerns of the individual and significant others.1-9

Grubbs et al. (2009)10 explored the predictive value of high frequency ultrasound in early identification of pressure ulcers in a cohort of older adults at high risk. The randomized controlled trial (RCT) failed to demonstrate that high frequency ultrasound was an effective strategy for predicting the development of Category/Stage I pressure ulcers of the heel or sacrum compared with a focused physical assessment (Level 2 study).

Comprehensive recommendations and guidance on specific areas of patient assessment are outlined in other sections of the full Clinical Practice Guideline including:

- Pain Assessment and Management,
- Nutrition in Pressure Ulcer Prevention and Treatment,
- Risk Factors and Risk Assessment,
- Repositioning and Early Mobilization,
- Assessment and Treatment of Infection and Biofilms, and
- The sections for special populations.

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Assessment of the individual also includes an assessment of the environment and resources that will influence the individual’s ability to heal. The Support Surfaces section of full Clinical Practice Guideline provides detailed recommendations on assessing the individual’s need for and availability of appropriate support surfaces.

2. Reassess the individual, the pressure ulcer and the plan of care if the ulcer does not show signs of healing as expected despite appropriate local wound care, pressure redistribution, and nutrition. (Strength of Evidence = C; Strength of Recommendation = )

2.1. Expect some signs of pressure ulcer healing within two weeks. (Strength of Evidence = B; Strength of Recommendation = )

2.2. Adjust expectations for healing in the presence of multiple factors that impair wound healing. (Strength of Evidence = B; Strength of Recommendation = )

If progress toward healing is not seen within two weeks, the individual, the pressure ulcer, and the plan of care should be re-evaluated. General signs of healing include decreased length, width, and depth of the ulcer; progressively less exudate; and changes in tissue type from less devitalized tissues (e.g., eschar and slough) to healthy regenerative tissues (e.g., granulation tissue and epithelialization). The health professional should be particularly alert to these signs when making a clinical judgment regarding the healing progress of the pressure ulcer.

Several investigators have analyzed data from large databases to address the question of how long it takes for a pressure ulcer to heal.11, 12 However, no definitive answers have emerged because the contextual variables affecting healing vary from study to study, just as they do from individual to individual. Healing rates and outcomes vary according to a myriad of factors, including:

- initial size and Category/Stage of the ulcer13-15
- presence or absence of infection,16
- adequacy of the treatment plan in relation to the current assessment of the ulcer,11,15
- co-morbidities, and
- nutritional status12, 17 (Level 3 studies).

In a 15-month longitudinal study of individuals with pressure ulcers (n = 119 individuals with 153 ulcers), van Rijswijk (1993)14 noted that ulcers that did not show at least a 45% reduction in size at two weeks or a 77% reduction at four weeks were less likely to heal during the study. In this study the pressure ulcers were treated with 3% hydrogen peroxide, saline rinse and a hydrocolloid dressing. Pressure redistribution support surfaces and repositioning were only used for those individuals that had already received such interventions prior to study enrolment (Level 3 study).

Category/Stage II pressure ulcers take less time to heal than Category/Stage III and IV ulcers. Lynn et al. (2007)18 reported that the median days to healing of Category/Stage II pressure ulcers in nursing home residents was 51 to 52 days. However, the analysis only included ulcers that had persisted for 30 days; Category/Stage II ulcers that healed more quickly were not included (Level 4 study). In a multi-site retrospective study of 774 nursing home residents with Category/Stage II pressure ulcers Bergstrom et al. (2008)19 reported median time to healing as 46 days. The initial size of the ulcer was significantly associated with median days to healing (i.e., 33 days for small \([\leq 1 \text{ cm}^2]\), 53 days for medium \([> 1 \text{ to } 4 \text{ cm}^2]\], and 73 days for large \([> 4 \text{ cm}^2]\) ulcers) (Level 4 study).

Mean times to healing were about twice as long for full-thickness (Category/Stage III and IV) pressure ulcers than for partial-thickness (Category/Stage I and II) pressure ulcers in a 12-week study of chronic wounds.11 Lynn et al. (2007)18 reported 140 to 150 days as median time to healing for nursing home residents with Category/Stage III and IV pressure ulcers, although this analysis only includes the few full-thickness ulcers that did heal during the study reporting period (Level 4 study). In a 1990 study of 19,889 residents of 51 nursing homes conducted over a 2-year period,
Brandeis et al. (1990)\textsuperscript{20} reported that the largest increment in healing occurred in the first three months, with 31.5\% of Category/Stage III and 23.3\% of Category/Stage IV ulcers healing within that time frame (Level 5 study). In 2004, using standardized assessment and advanced treatment protocols, Bolton et al. (2004)\textsuperscript{11} reported that 36\% of 373 Category/Stage III and IV pressure ulcers healed during the 12-week study period, with an average healing time of 62 days (± 54 days) (Level 5 study).

3. Teach the individual and his or her significant others about:
   • the normal healing process,
   • how to identify signs of healing or deterioration, and
   • signs and symptoms that should be brought to the health professional’s attention. (Strength of Evidence = C; Strength of Recommendation = \textsuperscript{3} \textsuperscript{3})

   This recommendation is based on expert opinion. An understanding of the prevention and treatment of pressure ulcers and factors that influence healing allows the individual to meaningfully contribute to his or her healthcare, including alerting the health professional to signs and symptoms of wound deterioration.\textsuperscript{21, 22} The Patient Consumers and Their Caregivers section of the full Clinical Practice Guideline provides recommendations on patient education and ongoing involvement in pressure ulcer prevention and management.

Pressure Ulcer Assessment

1. Assess the pressure ulcer initially and re-assess it at least weekly. (Strength of Evidence = C; Strength of Recommendation = \textsuperscript{3} \textsuperscript{3})

   1.1. Document the results of all wound assessments. (Strength of Evidence = C; Strength of Recommendation = \textsuperscript{3} \textsuperscript{3})

   A two-week period is recommended for evaluating progress toward healing. However, weekly assessments provide an opportunity for the health professional to assess the ulcer more regularly, detect complications as early as possible, and adjust the treatment plan accordingly.

2. With each dressing change, observe the pressure ulcer for signs that indicate a change in treatment is required (e.g., wound improvement, wound deterioration, more or less exudate, signs of infection, or other complications). (Strength of Evidence = C; Strength of Recommendation = \textsuperscript{3} \textsuperscript{3})

   Wound status can change rapidly. Wound improvement or deterioration indicated by change in wound dimensions, change in tissue quality, an increase or decrease in wound exudate, signs of infection or other complications all provide indications of the effectiveness of the current management plan. The person responsible for dressing changes should be educated regarding signs and symptoms of complications that should be reported to the health professional. The Assessment and Treatment of Infection and Biofilms section of the full Clinical Practice Guideline provides more information on signs and symptoms associated with pressure ulcer infection.

   A longitudinal study by Edsberg et al. (2011)\textsuperscript{23} investigated strategies to predict wound healing times. Participants were seen every day for ten days then weekly until study end (42 days). Findings identified that ulcer size at day 0 was a significant predictor of time to heal (p = 0.023), with smaller wounds taking less time to heal. Average daily healing was positively correlated with initial wound size (p = 0.3537). While percent area measurements are considered the easiest to determine, this measurement is sensitive to initial wound size. Linear healing rate is a reliable indication of healing. A four-week response time with regular recording of a validated wound measurement achieves a reliable indicator of response to care.

   2.1. Address signs of deterioration immediately. (Strength of Evidence = C; Strength of Recommendation = \textsuperscript{3} \textsuperscript{3})
This recommendation is based on expert opinion. Signs of deterioration (e.g., increase in wound dimensions, change in tissue quality, increase in wound exudate or other signs of clinical infection (see the Assessment and Treatment of Infection and Biofilms section of the full Clinical Practice Guideline) should be addressed immediately.

Where the goal of care is to achieve pressure ulcer healing, management should be re-evaluated if there are no indications of progress toward healing within two weeks of initiating an appropriate wound management plan and a pressure care plan. The Special Populations: Individuals In Palliative Care section of the avas full Clinical Practice Guideline discusses ongoing management in cases where healing the wound is not a primary goal of care.

3. Assess and document physical characteristics including:
   - location,
   - Category/Stage,
   - size,
   - tissue type(s),
   - color,
   - periwound condition,
   - wound edges,
   - sinus tracts,
   - undermining,
   - tunneling,
   - exudate, and
   - odor. (Strength of Evidence = C; Strength of Recommendation = )

4. For Category/Stage II to IV and unstageable pressure ulcers in individuals with darkly pigmented skin, prioritize assessment of the following characteristics:
   - skin heat,
   - skin tenderness,
   - change in tissue consistency, and
   - pain. (Strength of Evidence = C; Strength of Recommendation = )

This recommendation is based on expert opinion. Inflammatory redness from cellulitis and deeper tissue damage may be difficult to detect in individuals with darkly pigmented skin. Just as Category/Stage I pressure ulcers and deep tissue injury in intact skin may go undetected in dark skinned individuals,24-31 the full extent and severity of open pressure ulcers may be overlooked without a full assessment of the surrounding skin (or where this is not possible or clear, the skin on the opposite side of the body). Diagnosis and treatment of cellulitis and/or undermining may be delayed or missed. Warm, firmer skin that is tender or painful may indicate infection, cellulitis or undermining/tunneling in the adjacent pressure ulcer.

Nakagami et al. (2010)32 utilized thermography to predict pressure ulcer healing. In this small study (n = 33), the relative risk for delayed healing in pressure ulcers with a wound temperature above the temperature of surrounding skin was 2.25 (95% confidence interval [CI] 1.13 to 4.47, p = 0.021). The study was of only three weeks duration and the sensitivity of the thermography in detecting pressure ulcers that would be slow to heal was 0.56. In a second trial, the research team combined thermography with ultrasound, reporting a sensitivity of 0.69 and specificity of 0.71 in predicting progression from Category/Stage I pressure ulcer to classification as a deep tissue injury33 (Level 4 studies). Although not explicitly used to assess individuals with darkly pigmented skin, the population was of Asian background, and further development of such thermographic imaging may prove useful in aiding pressure ulcer assessment in dark skinned individuals.

5. Position the individual in a consistent neutral position for wound measurement. (Strength of Evidence = C; Strength of Recommendation = )
This recommendation is based on expert opinion. It is possible to distort soft tissue with variations in positioning yielding a larger or smaller measurement depending on position of the individual. For example, it may be helpful to note that a sacral ulcer was measured with the individual turned at a 90° angle on his/her left hip with legs extended. Leg flexion and variations in the turning angle can distort tissue and result in very different measurements.

6. Select a uniform, consistent method for measuring wound length and width or wound area to facilitate meaningful comparisons of wound measurements across time. (Strength of Evidence = B; Strength of Recommendation = )

The manual measurement technique that yields the least overestimation for various wound shapes is to measure the longest length of the ulcer head-to-toe, and longest width side-to-side, perpendicular (at 90°) to the length34 (Level 5 study). Measuring the longest length of the ulcer (regardless of orientation) and a perpendicular width is more sensitive in monitoring wounds with changing shapes and configurations; however, this method increases the risk of overestimation, and potentially introduces variability in the selection of the longest length.

Acetate tracings and planimetry measurements of wound area tend to provide more accurate measurements of irregularly shaped wounds; however, this method is more labor intensive.

One electronic method of wound tracing has shown good reliability under appropriate conditions.35, 36 Haghpanah et al. (2006)35 compared two different electronic data collection systems (Visitrak™ and a digital system that is no longer available) to manual linear measurement using a disposable paper ruler in 40 different pressure ulcers. The Visitrak™ system requires the clinician to trace the wound using transparent tracing paper, after which the wound tracing is placed on the Visitrak™ tablet and retraced. The electronic tracing system was found to be more reliable in repeated measures than linear measurement (Level 4 study). In a second study, Sugama et al. (2007)36 investigated the reliability of the Visitrak™ system. Four nurses used the system to perform wound tracings on ten pressure ulcers for investigation into the reliability. Both interrater and intrarater reliability were almost perfect (r = 0.99). The validity of measures was also investigated using comparison with digital planimetry calculated from a photograph for 30 pressure ulcers. There was a significant positive correlation between Visitrak™ wound tracings and digital planimetry (r = 0.99, p < 0.001) (Level 4 study).

For clinical practice, a method that balances validity, reliability, and clinical utility should be selected and consistently used. For research purposes, a more labor intensive but precise technique may be desirable.

7. Select a consistent, uniform method for measuring depth. (Strength of Evidence = C; Strength of Recommendation = )

Caution: Care should be taken to avoid causing injury when probing the depth of a wound bed or determining the extent of undermining or tunneling.

This recommendation is based on expert opinion. Measurement of pressure ulcer depth and measurement of areas of tunneling and undermining are typically performed through the very gentle insertion of a pre-moistened (with normal saline or sterile water) cotton-tipped applicator to the gentle point of resistance. The applicator is then marked off at the point that it meets skin level, then removed and held alongside a ruler to determine depth measurement in centimeters.

8. Consider further diagnostic investigations of wound bed tissue when healing does not progress. (Strength of Evidence = C; Strength of Recommendation = )

In some cases tissue biopsies can improve understanding of the healing process and potential for healing. Differential expression levels of specific wound proteins assayed by mass spectrometry and multiplexed microassays are predictive of healing in the wound. In a longitudinal study, Edsberg et al. (2012)37 identified significant differences in levels of 21 wound proteins in various parts (periphery
versus interior) of the wound tissue between chronic pressure ulcers and those that healed (Level 4 study).

9. **Use the findings of a pressure ulcer assessment to plan and document interventions that will best promote healing.** (Strength of Evidence = C; Strength of Recommendation = ⬃ ⬃)

9.1. **Reevaluate the pressure ulcer assessment plan if the pressure ulcer does not show signs of healing within two weeks.** (Strength of Evidence = C; Strength of Recommendation = ⬃ ⬃)

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

Where the goal of care is to achieve pressure ulcer healing, treatment should be re-evaluated if there are no indications of progress toward healing within two weeks of initiating an appropriate wound management plan and a pressure care plan. Adjust the timeframe for expected healing according to the individual’s overall clinical status. The *Special Populations: Individuals In Palliative Care* section discusses ongoing management in cases where healing the wound is not a primary goal of care.

**Methods for Monitoring Healing**

Currently in clinical practice pressure ulcers are monitored using the clinical judgment of a health professional supported by pressure ulcer assessment tools and digital photography. In some clinical settings, digital data collection devices are becoming available.

1. **Assess progress toward healing using a valid and reliable pressure ulcer assessment scale.** (Strength of Evidence = B; Strength of Recommendation = ⬃)

Numerous pressure ulcer assessment scales/tools have been designed to aid in assessing the progress of pressure ulcer healing, including the Bates-Jensen Wound Assessment Tool (BWAT), the Pressure Ulcer Scale for Healing (PUSH©), the Pressure Sore Status Tool (PSST) and DESIGN/DESIGN-R.

The BWAT is a 15-item tool with 13 wound characteristics scored using a Likert scale and an additional two unscored items. The detailed wound assessment data provided by the BWAT can be used as a basis for treatment decisions. The BWAT score correlates with the severity of the wound, with higher scores indicating more severe wounds. The BWAT has been used as a standardized assessment and treatment protocol that showed favorable results in healing chronic wounds. The BWAT has undergone content and concurrent validation and clinical evaluation. Interrater reliability among health professionals was 0.78, and intrarater reliability was 0.89 (Level 3 study); inter-item correlation has also been examined (Level 4 study).

The PUSH tool was developed by the National Pressure Ulcer Advisory Panel (NPUAP) as an alternative to reverse staging and as a method of monitoring healing ulcers. Using existing research databases, a principal components analysis was conducted to determine the factors most predictive of pressure ulcer healing or deterioration. Three factors (length by width, exudate amount, and predominant tissue type) explained 55 to 65% of the variance at weeks 0 through 8 for the study sample, with good discrimination between time points (Level 5 study). In a study by Hon et al. (2010) PUSH tool scores correlated well with wound tracings ($r = 0.63, p = 0.01$), supporting the results of (Level 4 study). The PUSH tool does not provide adequate information to serve as a basis for a comprehensive treatment plan. However, it does provide an efficient mechanism for monitoring whether the ulcer is deteriorating or improving over time and it has been successfully used in research studies to measure healing outcomes.

The DESIGN (and revised version, DESIGN-R) is a tool developed in Japan for classifying pressure ulcer severity and monitoring healing. It has evidenced good interrater reliability (0.91 for clinical assessments and 0.98 for assessment based on photos), and shows a high correlation with PSST scores (Level 5...
1. A positive change of at least one point in DESIGN-R score is significantly associated with complete wound healing within 30 days (Level 2 study). The DESIGN-R also has good interrater reliability (interclass coefficient [ICC] = 0.960) and a high correlation with BWAT scores (Level 4 study).

2. Use clinical judgment to assess signs of healing such as decreasing amount of exudate, decreasing wound size, and improvement in wound bed tissue. (Strength of Evidence = C; Strength of Recommendation = )

   Experienced health professionals are often astute in monitoring progress toward healing in wounds; however, there is room for variability when multiple health professionals are evaluating the pressure ulcer over time. George-Saintilus et al. (2009) found poor correlation between clinical judgment of health professionals and PUSH tool scores (κ = 0.11 to 0.32) in the assessment of 48 individuals (370 total assessments) with Category/Stage II to IV pressure ulcers. Considering the strong correlations that have been established between PUSH scores and objective outcomes (e.g., wound tracings), the study suggests caution should be taken when relying on only clinical judgment to assess wound progress.

   When relying on clinical judgment to assess progress toward healing, there should be clear documentation and ongoing communication among the various health professionals providing care for the individual.

3. Consider using baseline and serial photographs to monitor pressure ulcer healing over time. (Strength of Evidence = C; Strength of Recommendation = )

   Some health professionals choose to use serial photographs as a method of monitoring pressure ulcer progress. Photographs should not replace bedside assessment, but may serve as a useful documentation strategy. If used, photographic techniques and equipment should be standardized to ensure accurate representation of the pressure ulcer condition that can be reliably compared over time. For example, Sprigle et al. (2011) found that the accuracy of digital wound photography was influenced by angle skew, especially when assessing wound dimensions. Errors of approximately 4% with a 10° angle skew were noted in this small trial.

   Davis et al. (2013) compared three dimensional (3D) wound imaging performed by wound experts and registered nurses to independently performed clinical assessments. Assessment of improvement based on viewing the 3D images significantly correlated with objective assessment of wound diameters and surface area (p < 0.01); however, attainment of a readable 3D image was only achieved in about half the pressure ulcer assessments and was lower for the registered nurses than the wound experts.

   In their study comparing digital photography to use of a standard wound assessment form that included wound descriptors, wound dimensions, exudate and wound bed assessments, Terris et al. (2011) established interrater agreement of 50% for digital photography (n = 31 assessments). Agreement when one nurse used digital photography and a second nurse used the standard wound assessment form was only 38.5%. Digital photography was considered labor intensive in this trial (Level 3 study).

Recent Research in Pressure Ulcer Assessment and Monitoring

Recent research on pressure ulcer assessment has included investigation into the role of digital assessment of the redness value of wounds. Iizaka et al. (2013) have undertaken pilot studies validating various measures for wound redness and have promising outcomes. However, this research is currently not feasible in most clinical settings.

Recent research into strategies to monitor pressure ulcer healing has also investigated the use of ultrasound. Two small studies by the same research team exploring the role of ultrasound produced findings indicating that characteristics of the fascia and deep tissue that are detectable using ultrasound may predict deterioration of a pressure ulcer versus its healing. Although promising, these techniques are in their infancy and are not routinely used in clinical practice to monitor pressure ulcers.
References


GLOSSARY OF TERMS — ASSESSMENT AND MONITORING EXTRACT

Cellulitis (regional infection, spreading infection): Bacteria and/or their products have invaded surrounding tissues causing diffuse, acute inflammation and infection of skin or subcutaneous tissues.1, 2

Chronic wound: A wound that does not proceed through the normal stages of healing in an orderly fashion but becomes stuck in one phase of healing.

Devitalized tissue: Tissue that is devoid of vitality or life (non-viable). It is normally moist, yellow, green, tan, or gray and may become thick and leathery with dry black or brown eschar.

Epithelialization: The process of becoming covered with or converted to epithelium. The new epithelial cells advance across the wound bed until they meet epithelial cells coming from the opposite direction.

Eschar: Black or brown necrotic, devitalized tissue. The tissue can be loose or firmly adherent and hard, soft, or somewhat soggy.1

Exudate: Fluid extruded from a tissue or capillaries that can include fluid, cells, or cellular debris that has escaped from blood vessels and been deposited in tissue surfaces. It may contain serum, cellular debris, bacteria, and leukocytes.1, 3

Fascia: A sheet or band of fibrous tissue that lies deep below the skin or encloses muscles and various organs of the body.

Friction blister: An area of skin that becomes red, inflamed or broken as a result of rubbing or sliding along a surface. A friction blister is not a considered to be a pressure ulcer.

Granulation tissue: The pink/red, moist, shiny tissue that glistens and is composed of new blood vessels, connective tissue, fibroblasts, and inflammatory cells that fills an open wound when it begins to heal. It typically appears deep pink or red with an irregular, granular surface.1

Induration: Tissue that is hardened to touch.

Infection: The presence of bacteria or other microorganisms in sufficient quantity to damage tissue or impair healing. Clinical signs of infection may not be present in the immunocompromised individual or the individual with a chronic wound. See Bacterial bioburden.

Periwound: The area immediately adjacent to the wound edge and extending out as far as the tissue color and consistency changes extend.

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.

Protein: A complex organic compound made up of chains of amino acid molecules. Proteins are responsible for the repair of injured tissue, fluid balance, antibody production, cellular function, and hormonal and enzymatic function. Proteins are a source of building material for muscle and for healing wounds.

Reepithelialization: The replacement of the epithelial layers of the tissue.

Sinus tract: A course or path of tissue destruction, sometimes called a tunnel, occurring in any direction from the surface or edge of a wound. It results in dead space with a potential for abscess formation. A sinus can be distinguished from undermining in that it involves only a small portion of the wound edge whereas
undermining involves a significant portion of the wound edge.\(^1\)

**Slough:** Soft, moist, devitalized (non-viable) tissue. It may be white, yellow, tan, or green, and it may be loose or firmly adherent.\(^1\)

**Tissue ischemia:** The reduction of oxygen levels to below normal.

**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.

**Tunneling:** See *Sinus tract*.

**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**
