HSE National Wound Management Guidelines 2018

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Clinical Strategy and Programmes Division

Office of the
Nursing & Midwifery
Services Director

HSE National Wound Management Guidelines 2018

This document is a Guideline

The Office of Nursing and Midwifery Services Director,
Clinical Strategy and Programmes Division,
Dr Steevens' Hospital,
Dublin 8.

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Approved by:	Dr Aine Carroll, National Director of Clinical Strategy and Programmes. Ms Mary Wynne, Interim Nursing and Midwifery Services Director.
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FOREWORD

Mary Wynne, Nursing and Midwifery Services Director

It is with great pleasure that I introduce the HSE National Wound Management Guidelines (2018). This guideline aims to support all clinicians in the clinical decision making process in their wound care practice. The availability of these national guidelines will also support the implementation of standardised wound care in healthcare organisations nationally and the quality and safety of patients/clients in our care.

Over the years we have embraced evidence based knowledge and skills related to advancing wound care management which are of crucial importance in meeting the needs of the patient/client safely, effectively and efficiently. Every day hundreds of patients/clients require care of their wounds in hospitals and community settings across the Health Service. Wounds have a major personal, social, and economic impact. They impact on the individual, their quality of life, and also have a significant impact on our health service and our society as a whole.

Healthcare is an ever changing science and advances and new developments in wound care continue to take place. This guideline "HSE National Wound Management Guidelines 2018" updates the 2009 guidelines and provides a national standardised evidence based approach and expert opinion for the provision of wound care management.

The revision of the HSE national guidelines for wound management is to ensure that the most up-to-date evidence is available to support the standardisation of care and encourage best clinical practice, and to contribute to improved patient outcomes. These guidelines constitute a general guide to be followed, subject to the medical practitioner's judgement in each individual case.

The guideline is applicable for hospitals and healthcare organisations, to ensure that patients with wounds throughout the country can benefit from the same high standards of care and quality of wound management interventions.

Nurses and midwives with clinical competence in wound management across hospitals and healthcare organisations play a vital role in the frontline clinical settings by promoting quality and continuity of care that enables patients/clients to be treated effectively and efficiently in the healthcare setting most appropriate to their needs.

On behalf of the HSE, I wish to sincerely acknowledge and express their gratitude for the effort and commitment of all those involved in revising the guideline. Particular thanks are extended to the national project team members, for their time, commitment and expertise in updating this pivotal guideline. For some this was performed on an honorary basis and in addition to their usual work commitments.

Mary Wynne
Health Service Executive
Interim Nursing and Midwifery Services Director

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The HSE National Wound Management Guidelines 2018 supersede all previous wound management guidelines

Disclaimer

The Project Team's expectation for the HSE National Wound Management Guidelines (2018) is that clinicians will use their clinical judgement and knowledge in applying the general principles and recommendations contained in this document. Recommendations may not be appropriate in all circumstances, and decisions to adopt specific recommendations should be made by the clinician taking into account the circumstances presented by individual patients and available resources. The research for the up to date evidence was up to and included 2017.

Part A: Guideline Recommendations

It is estimated that 1.5% of the population worldwide develop a wound at any one time (Gottrup, 2004). The growing prevalence and incidence of non-healing wounds (acute and chronic) are a major source of morbidity to patients and a major cost to hospital and community healthcare providers globally (Posnett et al., 2009). Changing population demographics, increased prevalence and incidence of multiple comorbidities are challenging health care providers to provide ever more complex interventions with fewer resources (Moore et al., 2014). It is estimated that between 25% and 50% of acute hospital beds are occupied by patients with a wound. Of these wounds between 55%-60% are non-healing wounds, infected surgical wounds, pressure ulcers and leg/foot ulcers (Posnett et al., 2009). Additionally, it is estimated that more than 23% of all hospital in-patients have a pressure ulcer, many of which are acquired during hospitalisation for an acute episode of illness or injury and therefore are avoidable (EPUAP, 2002).

Ireland in the past decade has experienced an unprecedented rise of 16% in population growth. Evidence indicates that the number of people over 65 years of age is expected to triple in the next 30 years (DoHC, 2010b). Consequently, the prevalence and incidence of wounds is likely to continue to increase due to the ageing population and the ongoing increase in prevalence of obesity, diabetes and lower extremity arterial disease (Chandan et al., 2009; HSE, 2009). Chronic wounds are associated with comorbidities such as hypertension, diabetes, cardiovascular and neurological illness (DoHC 2007a; DoHC 2007b). The costs associated with wound care are substantial; four per cent of the United Kingdom's (UK) health care budget is spent on wound care (Posnett and Franks, 2007). Chronic wounds of all aetiologies cost the Irish Health Service Executive an estimated at €285.5 million per annum (Mc Dermott-Scales et al., 2009). The epidemiology of wounds section (appendix I) discusses these issues in greater depth. Furthermore, wound therapeutics are continuously evolving requiring the clinician to keep abreast of the research evidence that will inform and underpin their practice to ensure that patients receive the evidence-based assessment and treatment options at the appropriate time.

Wound healing is a dynamic process and normal wound healing occurs in a precise and timely manner. Wound management is also dynamic and is dependent on the clinician's ability and skill in assessing, planning care and evaluating outcomes. The duration of wounds is directly related to prolonged healing rates (Bosanquet and Harding 2014). Early focused treatment of wounds

that fail to respond to standard care may reduce the burden of wounds that become chronic. The wound healing process is further discussed in appendix II.

One of the objectives of the HSE Corporate Plan (2008-2011) was to ensure that sufficient healthcare professionals have the appropriate competencies to deliver its objectives in maximising the level and quality of service delivery at an affordable cost. A key focus of The Patient Charter, *You and your health service* (2014) is committed to '*supporting quality improvement throughout the health system to improve outcomes and reduce patient harm*'. The complexity of wounds requires practitioners who are skilled in wound assessment, diagnosis, treatment and evaluation of outcomes (Harding et al., 2013). Continuing Professional Development (CPD) is essential to ensure optimal delivery of patient care (An Bord Altranais, 2000).

The recommendations are divided into specific sections to enable the clinicians to directly seek the advice relating to a particular clinical practice situation which they need to address.

- General Wound Care
- Diabetic Foot Ulcers
- Pressure Ulcers
- Leg Ulcers
- Palliative Wound Care
- Education

Whilst no single healthcare discipline can completely meet the complex needs of those presenting with challenging wounds, it is essential that healthcare professionals from all disciplines are aware of the standards and prevention strategies, knowing when and how to refer the patient with a challenging wound (O'Neill, 2006).

1. General Wound Care

General wound management incorporates comprehensive assessment of both the patient and their wound. The increasing evidence on the effects of exudate, wound bioburden, infection and nutrition are comprehensively dealt with in this section.

1.1 Clinican Knowledge

Clinical Question 1: What is the essential knowledge that the clinician requires to provide an evidence-based approach to wound management?

Evidence Statement

The evidence to support this recommendation is largely derived from textbooks on wound care and from research exploring clinicians' wound care knowledge and decision-making.

Recommendations

1.1 All clinicians who care for patients with wounds should have knowledge of wound healing physiology, including the stages of wound healing.
HSE Recommendation Evidence Grade: D

1.2 All clinicians should be able to understand and recognise the physiological pathway across all wound healing processes; primary intention, secondary intention and delayed primary intention wounds.
HSE Recommendation Evidence Grade: D

Clinical Question 2: What factors affect the process of wound healing?

Evidence Statement

Acute wounds

Acute wounds will generally proceed through an orderly and timely process to produce a healed wound which has anatomic and functional integrity. However, there are physiological factors which may enhance or impede wound healing (Table 1).

Chronic Wounds

Chronic wounds are defined as those whose healing is impaired. The inflammatory phase is dysfunctional due to intrinsic and extrinsic factors that impact on the person, the wound or the healing environment (Swanson et al., 2015). Chronic wounds include a variety of aetiologies, yet they share a number of characteristics such as a persistent state of inflammation due to high levels of pro-inflammatory cytokines and unregulated proteolytic activity as a result of the high levels of active proteases and defective neutrophils, with an imbalanced expression of tissue inhibitors i.e. metalloproteinases. There is also a denaturing of growth factors (Moore, 2010). It is more recently accepted that biofilm may be responsible for this persistent inflammatory state (Swanson et al., 2016).

Recommendation

2.1 Clinicians should consider all factors that enhance or impede the wound healing process in the development of the plan of care (Table 1).

HSE Recommendation Evidence Grade: B

Table 1: Factors affecting Wound Healing Ability (Adapted from Wounds International [2011])

Area	Factors
Patient	• Aetiology • Co-morbidity e.g. diabetes mellitus, auto-immune disease • Nutritional Status • Allergy • Medication e.g. steroids • Psychosocial status • Pain • Concordance
Wound	• Duration • Size • Wound Bed Condition • Ischaemia • Inflammation/infection • Anatomical Site • Treatment Response
Care Provision	• Skill and knowledge • Healthcare system

1.2 Wound Healing in Children

Clinical Question 3: What specific knowledge does the clinician require to manage wounds in children?

Evidence Statement

Wound healing in children generally follows the same process as adults; however, there is an increased production of collagen and elastin. Granulation tissue is created at a faster rate than in adults, resulting in a faster healing process (Byrant and Nix, 2016). There is a paucity of evidence examining the treatment of paediatric wounds, with most evidence being anecdotal, opinion based or extrapolated from adult research (Baharestani, 2007; Byrant and Nix, 2016).

Recommendation

3.1 The clinician must appreciate that there may be a more rapid progression through the wound healing process in children.
HSE Recommendation Evidence Grade: D

3.2 The considerations of the child should be included in all prevention, assessment and management strategies for wounds.
HSE Recommendation Evidence Grade: D

1.3 Wound Assessment

Accurate and timely wound assessment within a holistic patient assessment, underpins effective clinical decision-making. It is pivotal to good wound management and should form the basis for wound care practice (Baharestani, 2007). Assessment enables appropriate clinical diagnosis and goal setting for the management of the wound in order to improve patient outcomes and reduce morbidity and costs (Posnett et al., 2009).

Objectives of Wound Care:

In the treatment of wounds, the clinician should endeavour to facilitate the following objectives of wound healing:

1. The wound should be allowed to heal in a moist wound environment unless the clinical goal is to maintain a dry wound bed, e.g. ischaemic foot
2. To address the issues observed in the assessment process
3. To promote wound healing

Clinical Question 4: What are the necessary elements that must be incorporated into a comprehensive wound assessment?

Evidence Statement

Due to the complexity and challenging nature of wound healing, a systematic and standardised approach to the assessment process is desirable to provide baseline information against which progress can be measured. Recording of wound size is a useful baseline indicator.

Assessment should include identification of all factors that may delay healing. Other factors to assess include current care and local wound environment (Peate and Glencross, 2015). The principles of wound assessment are central to all wound types, although some aetiologies such as leg ulceration, pressure ulceration, diabetic foot ulceration and malignant fungating wounds require additional considerations.

Recommendations

4.1 A partnership approach to care is used in which the patient is provided with information relating to proposed assessment and planned care options. The patient's age, status and/or other co-factors may impact on the relationship.
HSE Recommendation Evidence Grade: D

4.2 The patient should receive a comprehensive assessment that reflects the intrinsic and extrinsic factors which have the potential to impact on wound healing or potential wound injury (see Table 1)
HSE Recommendation Evidence Grade: D

4.3 The patient's general assessment should include at a minimum:

- Past medical/surgical history
- Current and past drug therapies
- Current and past wound treatments/therapies
- Identification of factors which have the potential to increase the risk of wounding (e.g. pressure) or increase the risk of delayed or non-healing in wounds. This may include e.g. pressure ulcer risk assessment and nutritional screening
- Cognitive ability

HSE Recommendation Evidence Grade: D

4.4 The patient should be informed of the outcome of the assessment and should be supported in the decision-making for potential management options.
HSE Recommendation Evidence Grade: D

4.5 The clinician must determine the frequency of reassessment based on the outcome at each dressing change and the goals of care.
HSE Recommendation Evidence Grade: D

4.6 The clinician undertaking the comprehensive assessment must document the findings that inform the management plan based on the assessment, thus promoting and enabling professional accountability.
HSE Recommendation Evidence Grade: D

Good Practice Point

The wound assessment should include at a minimum:

- Type of wound and aetiology
- Location of wound
- Duration of wound
- Exudate description
- Condition of the wound bed
- Size of wound (Measurement)
- Condition and sensation of peri-wound skin
- Presence of Infection
- Presence and nature of pain
- Objectives of wound healing

Clinical Question 5: What assessment tool should be used to provide a comprehensive wound assessment?

Evidence Statement

An action evaluation study by Greatrex-White and Moxey (2015) addressed this question by examining the wound assessment tools currently available and the suitability of these tools to nursing practice. Other evidence which assisted in answering the above question originated in the guidance document: 'Triangle of Wound Assessment' (Wounds International, 2015). The conclusion reached within this literature is that while wound assessment tools are available to support clinicians, there is a lack of consensus on identifying an optimal/ideal tool.

Recommendations

5.1 A standardised and comprehensive wound assessment tool that ensures consistency should be used in the assessment of all patients with a wound(s).
HSE Recommendation Evidence Grade: C

Refer to appendix III for examples of wound assessment tools.

Clinical Question 6: How should wound exudate be assessed?

Evidence Statement

Wound exudate is a key healing component in the healthy wound. Traditionally, clinicians have considered exudate in terms of its volume alone. This approach fails to recognise the potential impact of wound exudate viscosity. Not only can the viscosity of wound exudate impact upon the absorptive performance of the wound dressing, but can also provide a valuable insight into the underlying health of the wound. It is necessary to assess, the colour, viscosity and volume of the wound exudate in terms of the health of the wound, and to rank the combination in terms of clinical significance. The exudate should be reassessed at each dressing change to determine whether the product and the wear-time of the dressing remain appropriate, and to indicate if the wound is healing or deteriorating (Davies, 2012). Dressings removed from the wound should be observed as part of the assessment. Soiled dressings provide information on the amount, colour, consistency and odour of exudate (WUWHS, 2007).

Existing guidance documents describing exudate assessment (Wounds International, 2015; World Union of Wound Healing Societies [WUWHS], 2015; Wounds UK, 2013; WUWHS, 2007) assisted in answering this question. Literature reviews by (White and Cutting, 2006a; Schultz and Mast, 1998) also described methods of exudate assessment.

These guidance documents discuss the features of exudate that should be assessed. The suggested descriptors to assist the clinician in the assessment and documentation of wound exudate (colour, consistency/viscosity and volume) aid the identification of potential causal/ contributory factors to delayed healing, and as such, assist in the management of patients with wounds.

Recommendations

6.1 The clinician should know the different descriptors of wound exudate and the clinical relevance of each.
HSE Recommendation Evidence Grade: D

6.2 Clinicians should ensure consistent phraseology is used to describe exudate.
HSE Recommendation Evidence Grade: D

Refer to appendix IV for a list of common exudate descriptors.

Good Practice Point

The clinician should assess and observe for the following:

- Primary/ secondary dressings used in relation to type, wear time, frequency of dressing changes, strikethrough (wet or dry), visible leakage and how saturated the dressing is on removal
- Wound moisture (e.g. visibly dry, moist/ glossy; wet; saturated; bathed in fluid). The volume of exudate should be recorded in all wound assessments and at each dressing change
- Peri-wound skin
- Documentation should include a description of the type, colour and consistency of exudate at each dressing change

Clinical Question 7: What criteria may be used to differentiate healthy and unhealthy wound

Evidence Statement

Wound Bed Preparation (WBP) is a clinical concept encompassing a systematic and holistic approach to wound assessment and treatment. Wound Bed Preparation promotes a wound environment that will allow normal progression toward wound healing (Falanga, 2003). The Tissue, Infamation/Infection, Moisture and Edge (TIME) concept is a useful guide to enable systematic assessment.

Recommendations

7.1 Clinicians should identify the wound appearance as a whole, observe for and be aware of the significance of the following:

- **Epithelialisation:** Epithelial tissue migrates across the wound surface. It is usually pinkish in colour. Sometimes it appears translucent and is confused with maceration
- **Granulation:** Granulation tissue is highly cellular, rich in macrophages and fibroblasts. Its extra-cellular matrix is composed of collagen, hyaluronic acid and fibronectin. It is often uneven and granular in appearance and is bright red.
- **Over-granulation:** Exuberant overgrowth of granulation tissue raised above the wound surface. Untreated, it retards epithelialisation
- **Infected:** Can be difficult to identify as signs of clinical infection vary between different wounds. Tissue is often friable and dull or beefy red in colour
- **Fungating:** Fungating refers to a malignant process where there is ulcerating (Crater) and proliferative growth. Some wounds are a mixture of both
- **Slough:** Comprised of dead cellular debris and usually yellow/white in appearance. Fibrin deposits are often present and make the removal of slough difficult
- **Necrosis:** Necrotic tissue is the result of tissue death secondary to ischaemia. Black or brown in appearance and may be dry and leathery in texture. It will delay healing
- **Haematoma**
- **Tendon**
- **Ligament**
- **Bone**

HSE Recommendation Evidence Grade: D

Clinical Question 8: How should a clinician measure the wound?

Evidence Statement

Wound measurement provides baseline information to aid decision-making and continuous measurement helps predict healing times in an objective manner (Fletcher, 2010).There is a dearth of evidence and discussion on wounds healing by secondary intention in relation to wound measurement incorporating depth (Ding et al., 2016). Whilst there is agreement that wound measurement is an objective component of wound assessment and is integral to planning and assessing progress, currently there is no validated, standardised measurement method. Methods used include; ruler, acetate, digital plainimetry, depth indicators, moulding materials, fluid, ultrasound, surface contour tracings, laser triangulation and photogrammetry.

Frequently used methods of wound measurement include:

- **Greatest length and width method:** The greatest length and the greatest width of the wound are measured across the diameter of the wound, from wound edge to wound edge.

- **Clock method:** The face of a clock is used to guide measurement. The 12 o'clock reference position is towards the head of the body and measurements are obtained from 12.00 to 6.00 and from 9.00 to 3.00. Depth should be included in both of these methods to provide a 3-dimensional measurement of the wound. Undermining and tunnelling using a depth indicator (gently placed into the cavity) can be measured using the clock method (Swezey, 2014).

Recommendations

8.1 The clinician should include wound measurement as an integral component of wound assessment.

HSE Recommendation Evidence Grade: D

8.2 Clinicians should choose from one of the following methods of measurement, using clinical judgement, resources and patient specific circumstance to guide their decision:

- ruler
- acetate
- depth indicators
- moulding materials
- fluid
- ultrasound
- surface contour tracings
- laser triangulation
- photogrammetry
- digital planimetry, and square counting are validated and have shown high inter-rater reliability.

HSE Recommendation Evidence Grade: D

8.3 Clinicians should continue to use a consistent measurement methodology for each wound.
HSE Recommendation Evidence Grade: D

8.4 The clinician should be competent in the use of the chosen measurement methodology for each wound.
HSE Recommendation Evidence Grade: D

Clinical Question 9: How should specific tissue types within the wound bed be quantified?

Evidence Statement

No studies were sourced to answer this question directly. Much of the existing literature concludes that the measurement of specific tissue types within one wound bed is subjective (Young, 2015). Even if using acetates, it is dependent on the clinicians' ability, knowledge base and a standardised approach. The following recommendation was made based on expert consensus.

Recommendation

9.1 The clinician should use an estimated percentage (%) to quantify the amount of each specific tissue type present in a wound; the percentage should total 100. A visual record of the tissue type(s) is beneficial e.g. photograph or acetate tracing.

HSE Recommendation Evidence Grade: D

Clinical Question 10: How should peri-wound skin be assessed?

Evidence Statement

Unhealthy peri-wound tissue has been characterised as dry, macerated, excoriated or inflamed (Ousey et al., 2013). It is important to demarcate the peri-wound area from the wound to prevent moisture damage and subsequent wound enlargement (Schultz et al. 2004).

Two guidance documents, 'Triangle of Wound Assessment' (Wounds International, 2015) and 'Effective Exudate Management' (Wounds UK, 2013) assisted in answering this question and formulating the following recommendations. Both documents stress the importance of timely and accurate assessment of peri-wound skin. Early identification of loss of integrity of peri-wound tissue is crucial to prevent the wound increasing in size and further delaying healing (Dowsett, 2009).

Recommendation

10.1 The clinician should assess the peri-wound skin at each dressing change for evidence of the following features:

- maceration
- excoriation
- erythema
- loss of colour
- blistering
- spongy texture
- loss of skin integrity
- hyperkeratosis

HSE Recommendation Evidence Grade: D

Please see section 3.10 for recommendations on moisture associated skin damage.

1.4 Wound Bioburden

The wound microenvironment is comprised of internal and external components. The internal section includes the cells that play a role in the healing process and the growth factors that regulate these cells. The external environment relates to the microbes that normally live on the skin and the environmental factors that may influence that colonisation (Scalise et al., 2015; Young, 2012). The external and internal environments are in continuous exchange with each other. It is now accepted that the microenvironment plays a key role in the wound healing process by regulating cellular activity and the maintenance of skin homeostasis (Kruse et al., 2015). This functional complexity clarifies how various factors such as age, ischaemia or infection can delay or arrest the normal healing process. It also highlights the need to focus on the manipulation of that microenvironment to address healing defects (Scalise et al., 2015). Most wounds contain microorganisms and many heal successfully in the presence of these organisms. Sometimes there is a disruption to the micro environmental interplay and organisms, particularly bacteria, invade, multiply and cause tissue damage resulting in a delay in wound healing, local wound infection and in some cases, systemic illness (WUWHS, 2008a).

The wound/host/bacteria relationship is changing continuously depending on local, environmental and systemic factors. Swanson et al. (2016) conducted a comprehensive review of contemporary literature, including systematic reviews and meta-analyses, and then conducted a Delphi process to reach consensus. The following wound infection continuum was agreed upon:

- contamination
- colonisation
- local Infection
- spreading Infection
- systemic infection

Current research is focusing on understanding why chronic wounds are not healing, the concept of spreading infection and the presence of biofilm. The challenge for the clinician is to detect the subtle signs of change in the wound that suggest the presence of biofilm (Swanson et al., 2016). This persistent inflammatory response is not only associated with delayed wound healing, it has a significant impact on the health related quality of life of the patient. It is a major cause of pain, odour and challenges associated with the management of high levels of exudate. It also impacts on health care costs. The wound requires more frequent dressing changes involving more advanced dressing products over more prolonged periods of time (Cutting and McGuire, 2015).

Clinical Question 11: What are the indicators of the presence of infection in the wound?

Evidence Statement

Wound bioburden has been the focus of much research and debate within the literature. It is accepted that an imbalance in the wound bioburden is one of the most influential barriers to wound healing (White and Cutting, 2006a). The clinical indications of this molecular and microbial disruption can include high levels of proteinaceous material - i.e. slough (Jones, 2006), excessive exudate and/or poor granulation tissue i.e. friable, or hyper granulation, a history of antibiotic failure, persistent or recurring infection, or the wound remains recalcitrant (Cutting et al., 2005; Metcalf et al., 2014). Additional signs include, abnormal smell, wound breakdown, pocketing at the wound base and bridging of epithelium. The presence of any combination of these indicators should alert the clinician to the possibility of chronic wound infection. Gardner at al. (2001) identified that increasing pain and increasing size were the two validated and reliable methods of identifying infection in the chronic wound and should be included here.

Acute Wounds

Trigger factors have been identified (WUWHS, 2008b) to aid the clinician in suspecting infection in the acute wound. These include; inflammation, new or increasing pain, local heat, swelling, advancing redness, increases in serous or purulent discharge, abscess or malodour. Some of these indicators also mimic the markers of inflammation. Therefore it is vital that clinicians are able to determine whether a change in these indicators is predictive of wound infection. Immuno-comprised patients, older adults or patients taking anti-inflammatory medication may not present with these classical signs.

Chronic Wounds

It is important to emphasise that the presence of slough, pus and/or necrotic tissue are not evidence of infection, but these non-viable substances do support bacterial growth (Ennis, 2010; Cutting et al., 2005). When present in conjunction with other outlined indicators, the suspicion index for infection is increased.

Early diagnosis of wound infection and early treatment are essential to minimise the risk of more serious complications and systemic illness (Cutting and White, 2004). Diagnosis is made on clinical manifestations, yet infection may produce different signs and symptoms in wounds of different types and aetiologies (WUWHS, 2008a). Scoring systems and diagnostic criteria have been developed to aid identification of infection in acute wounds such as surgical site infections e.g., ASEPSIS (Wilson et al., 1986) and the definitions as developed by the Centres for Disease Control and Prevention (CDC, 1992) further adapted by (Leaper et al., 2013).

The WUWHS (2008b) identified additional criteria to assist in identifying wound infection in such patient cohorts. These include:

- loss of appetite

- general lethargy, malaise
- inability to undertake normal activities
- a deterioration in glycaemic control in patients with diabetes
- there may be other subtle changes in the wound bed; e.g., wound bed colour may appear darker, less vascular and there may be an increase in slough (Jones, 2012a)

The group (Gardner et al., 2001) highlighted that the development of new pain or a change in existing pain was one of the strongest indicators of acute wound infection. The International Wound Infection Institute recommends a set of definitions for identification of surgical site infections (Keast and Swanson, 2014). This classification identifies superficial/incisional, deep/incisional and organ or space surgical site infections. Most of the focus thus far has been on the local manifestations of acute wound infections. Depending on the virulence of the pathogenic organism, the bacterial load and/or the efficacy of the host defence mechanisms, this wound infection may become systemic and present as a sepsis, severe sepsis or septic shock with associated morbidity and/or mortality (National Clinical Effectiveness Committee, 2014; Health Protection Agency, 2009; Young et al., 2008).

Clinical judgment, a detailed patient history and a comprehensive assessment of the wound are the pivotal tools to recognise infection in the wound. The routine taking of wound swabs is not recommended (Brown, 2015). While there isn't a 'best technique' identified or validated for obtaining a wound swab, the Levine Technique (refer to *appendix V)* is promoted as the most useful in enabling a quantitative microbiological analysis to be obtained (WUWHS, 2008a; Edwards-Jones, 2013). The information elicited from a swab depends on the level of detail that is provided with the laboratory request. Information should include patient details, wound or surgical site details, risk factors, treatment details and any clinical concerns e.g., the presence of pus in the wound (Edwards-Jones, 2013; WUWHS, 2008a). Caution should be exercised when interpreting the microbiological report in isolation; the condition of the patient and the wound must form an integral part of the on-going plan of care.

The following should be considered as indicators to take a wound swab:

- Cellulitis
- Discharge - serous exudate with inflammation
  Seropurulent
  Haemopurlent
  Pus
- Delayed normal healing
- Discolouration of wound bed; beefy red / dull purplish
- Unexpected pain/tenderness/change in type of pain & duration
- Over-granulation of tissue that bleeds easily
- Sudden increase in the amount of exudate from wound
- Abnormal smell
- Bridging/ pocketing at base of wound
- Friable granulation tissue that bleeds easily

- Wound dehiscence

(Cutting and Harding, 1994; Patten, 2010)

Other clinical signs include:

- Patient shows signs of a systemic infection such as pyrexia, raised white cell count, blood C reactive protein levels (CRP) and/or blood erythrocyte sedimentation rate (ESR)
- Patients that are elderly or immunosuppressed tend to be more susceptible to wound infections and present with other symptoms exhibiting drowsiness, loss of appetite, nausea, restlessness and confusion
- The swab is part of a screening programme, for meticillin-resistant *Staphylococcus aureus* (MRSA).

It should be noted that inflammation at a wound site can be part of the healing process and is not a clinical indicator for infection, therefore inflammation in isolation is not a reliable indication for taking a swab or treating a wound for infection (Ferguson, 2005).

Recommendations

11.1 Clinicians must maintain a high level of clinical suspicion for wound infection particularly when any of the systemic and/or local risk factors are identified in Table 2 below.
HSE Recommendation Evidence Grade: D

11.2 The clinician must determine the ensuing action based on the severity of the risk factors, e.g. the patient's immune status or reduced tissue perfusion.
HSE Recommendation Evidence Grade: D

11.3 Clinicians must appreciate the need to conduct a comprehensive, detailed consistent assessment of the wound, the exudate and the wound bed to detect the subtle signs of infection in the wound.
HSE Recommendation Evidence Grade: D

11.4 Clinicians must develop their knowledge and skill to enable them to recognise the signs and symptoms of infection in an acute wound versus a chronic wound.
HSE Recommendation Evidence Grade: D

11.5 Clinicians need to identify the relevance of any new or change in existing pain as an indicator of acute infection.
HSE Recommendation Evidence Grade: C

11.6 Clinicians must recognise that a wound swab is only helpful in isolating the pathogen to provide specific goal driven management. A consistent, standardised approach to obtaining a wound swab is essential for example the Levine Technique (refer to *appendix V*).
HSE Recommendation Evidence Grade: D

11.7 Clinicians must be aware that microbiological analysis can be employed to guide management and that sampling techniques may include; wound swabbing, wound biopsy and/or needle aspiration.
HSE Recommendation Evidence Grade: D

11.8 In the absence of clinical signs of infection there is no requirement for routine swabbing of the wound for microbiology.
HSERecommendation Evidence Grade: D

Table 2: Signs and symptoms associated with wound infection (IWII 2016)

Signs and symptoms associated with stages of the wound infection continuum (IWII 2016)					
Contamination	**Colonisation**	**Local Infection**		**Spreading Infection**	**Systemic Infection**
All wounds may acquire micro-organisms. If suitable nutritive and physical conditions are not available for each microbial species, or they are not able to successfully evade host defences, they will not multiply or persist: their presence is therefore only transient and wound healing is not delayed	Microbial species successfully grow and divide but do not cause damage to the host or initiate wound infection	Subtle signs of local infection Hypergranulation (excessive 'vascular' tissue) Bleeding, friable granulation Epithelial bridging and pocketing in granulation tissue Wound breakdown and enlargement Delayed wound healing beyond expectations New or increasing pain Increasing malodour	Overt (classical) signs of local infection • Erythema • Local warmth • Swelling • Purulent discharge • Delayed wound healing beyond expectations • New or increasing pain • Increasing malodour	Extending in duration +/- Erythema Lymphangitis Crepitus Wound breakdown/dehiscence with or without satellite lesions Malaise/lethargy or non-specific general deterioration Loss of appetite Inflammation, swelling of lymph glands	Severe Sepsis Septic shock Organ failure Death

Question 12: What factors should be considered in the management of wound infection?

Evidence Statement

The aim of effective management of the patient with a wound infection is to restore balance to the interaction between the patient and the infecting microorganism. A multidisciplinary approach and if necessary, referral to a specialised wound expert should be considered (WUWHS, 2008a).

Simultaneous maximising of the host response, treatment of the wound bed and the general wellbeing of the patient all form part of the management of the patient with a wound infection. The host response will be enhanced by the management of co-morbidities, elimination of risk factors, optimial nutrition and hydration status, and treatment of any other sites of infection. Treatment of the wound to reduce bacterial load includes; facilitating wound drainage, managing excessive exudate, debridement and removal of devitalised necrotic tissue and prevention of further or super infection by the adoption of relevant infection control principles. The judicious use of topical /antiseptic/antimicrobial agents may also be employed.

The general wellbeing of the patient is the most important factor in the effective treatment of wound infection. Elimination of stressors such as pain and sleep deprivation are essential. The education of the patient and the family and the active participation of the patient in their plan of care are also necessary. A systematic, comprehensive reevaluation of the progress/response to the treatment regime is essential. This must be standardised and allowed for comparison between the frequent reassessments to ensure progress, or early detection of stasis or deterioration can be detected.

The algorithm for managing wound infection proposed by IWII (2016), European Wound Management Association [EWMA] (2006) and the schematic management approach by WUWHS (2008b) are helpful in facilitating a systematic approach to the management of wound infection.

Refer to appendix V for the (IWII, 2016) algorithm on wound infection management.

Recommendations

12.1 A multidisciplinary approach is recommended in the management of wound infection.

HSE Recommendation Evidence Grade: D

12.2 The management of wound infection requires the clinician to adopt a three-fold approach that enhances host response, focuses on the wound bed and addresses the general wellbeing of the patient.

HSE Recommendation Evidence Grade: D

12.3 The clinician must manage the co-morbidities, eliminate or modify the risk factors, and optimise the nutrition and hydration status. Other sites of infection need to be treated concurrently.
HSE Recommendation Evidence Grade: D

12.4 Clinicians should consider reducing the bacterial load ***by doing one or all*** of the following; facilitating wound drainage; managing excessive exudate; debridement; removal of devitalised tissue and/or necrotic tissue and prevention of further or super infection by the adoption of relevant infection control principles.
HSE Recommendation Evidence Grade: D

12.5 Clinicians must be judicious in the use of topical antiseptic/antimicrobial agents.
HSE Recommendation Evidence Grade: D

Please refer to section 1.11 for comprehensive guidance on the use of antimicrobial agents.

12.6 Clinicians should recognise that the general wellbeing of the patient is an important factor in the effective treatment of wound infection. Therefore elimination of stressors such as pain and sleep deprivation are essential.
HSE Recommendation Evidence Grade: D

Refer to appendix V for an algorithm for managing wound infection which may help the clinician in facilitating a systematic approach to the management of wound infection.

12.7 The clinician must conduct a systematic, comprehensive re-evaluation of the response to the treatment regimen. This assessment must be consistent to facilitate comparison between each assessment and to ensure that progress or early detection of stasis or deterioration can be detected.
HSE Recommendation Evidence Grade: D

12.8 The adoption of a concurrent multi-modal strategy to treat biofilm must be recognised by the clinician as pivotal to enabling the wound to progress to healing. These strategies may include:

- frequent debridement
- anti-biofilm agents
- selective antimicrobials
- antibiotics

HSE Recommendation Evidence Grade: B

1.5 Wound Biofilm

Question 13: What is the role of biofilm in wound healing?

Evidence Statement

Aggregated communities of slow growing bacteria attach themselves to a wound surface and eventually form a biofilm (Bjarnsholt, 2013). Biofilm formation progresses through a number of stages as the bacteria become more attached to the wound surface. Fully mature biofilm continuously shed planktonic bacteria and fragments of biofilm, which can disperse and attach to other parts of the wound bed or to other wounds, forming new biofilm colonies (Philips et al., 2010). Hard-to-heal wounds are often chronically infected, producing a pattern of growth associated with biofilm which can be 500-50000 times more tolerant to antimicrobials. Wounds that have a biofilm-based infection demonstrate:

- a slower progression than acute infection
- an adaptive inflammatory response
- resistance to antibiotics and any other conventional antimicrobial strategies
- an innate ability to evade the host's defences (Brambilla et al., 2016)

The biofilm growth phenotype protects the bacteria from both antibiotics and other antimicrobial agents such as silver, and from host defence mechanisms such as the immune system (Philips et al., 2010).

Management of Biofilm in Wounds

The question of whether biofilm can be recognised clinically is controversial and challenging. Some guidelines have been proposed to help the clinician. These incorporate a number of clinical and non-clinical cues to guide the clinician to adopt a suspicious approach to the possible presence of biofilm in the wound (Keast and Swanson, 2014; Metcalf et al., 2014; Percival et al., 2015).

Biofilm-based wound care is founded in adopting multiple treatment strategies concurrently. These include; antibiotics, antibiofilm agents, selective antimicrobials and frequent debridement (Wolcott et al., 2008). The importance of maximising the host response in conjunction with wound focused management has been reinforced by Hurlow et al. (2015). Wound Bed Preparation to include removal of slough and necrotic tissue combined with cleansing with an appropriate cleansing agent on a regular/timely basis is fundamental (WUWHS, 2016). The solution identified to have the optimum autolytic debridement effect on the wound bed is, a combination of polyhexanide and betane which acts as a surfactant. Evidence suggests that this reduces inflammatory signs, prolongs a barrier effect and accelerates healing (Bellingeri et al., 2016).

The use of topical antimicrobial products is employed once the wound bed is prepared. The purpose of the antimicrobial dressing is to prevent the biofilm from redeveloping. A number of active antimicrobial agents have been linked to biofilm treatment. Wolcott et al. (2008) caution that there is a need to maintain a comprehensive detailed assessment of the wound, identifying indicators of progress towards healing as a determinant of effective management of biofilm. They also highlight the need to change antimicrobial agents if healing progress is not established or regresses.

Recommendations

13.1 Clinicians must consider the presence of biofilm in a wound that is hard-to-heal or chronically infected.

HSE Recommendation Evidence Grade: D

13.2 Clinicians should consider that wounds that have a biofilm-based infection demonstrate:

- a slower progression than acute infection
- an adaptive inflammatory response
- resistance to antibiotics and any other conventional antimicrobial strategies
- an innate ability to evade the host's defences

HSE Recommendation Evidence Grade: D

13.3 Clinicians should consider a multimodal approach to the management of biofilm.

HSE Recommendation Evidence Grade: D

1.6 Wound Care and Pain

Pain is described as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage” (IASP, 2012). It is an unpleasant complex, subjective and perceptual phenomenon that is influenced by physiological, psychological, emotional and social factors. There is an increasing acknowledgement that pain is a major issue for patients suffering from many different wound types (Woo, 2010; Richardson and Davies, 2011; Upton, 2011).

The most common types of pain associated with chronic wounds may have both nociceptive and neuropathic elements. Nociceptive pain arises from damaged tissue. Signals are picked up by sensory receptors in nerve endings in the damaged tissue; the nerves transmit the signals to the spinal cord, and then into the brain where the signals are interpreted as pain. Nociceptive pain may be described as ‘sharp’ or ‘stabbing’. Neuropathic pain is caused by damage to or dysfunction of the nervous system, and is a major contributor to chronic pain. It may differ in character from nociceptive pain, e.g. produce burning or tingling sensations (EWMA, 2002; Mudge and Orsted, 2010).

Wound pain can also be categorised as:

- **Background pain** – continuous or intermittent pain that is felt even at rest
- **Incident pain** – pain that occurs during day-to-day activities such as mobilisation or coughing
- **Procedural pain** – pain that results from routine procedures such as dressing changes or wound cleansing
- **Operative pain** – pain associated with significant wound intervention, e.g. debridement or wound biopsy

Impact of Pain

Pain is a stressor, triggering the stress response with an outpouring of the adrenal hormones cortisol and corticosterol. These hormones have an impact by delaying the inflammatory response and further delaying healing. Pain impacts upon the patients’ quality of life leading to reduced appetite and sleep deprivation, which further aggravate the stress responses.

Question 14: How should pain be assessed in patients with wounds?

Evidence Statement

A guidance document on wound infection and pain (Mudge and Orsted, 2010) and a consensus document by the World Union of Wound Healing Societies (2004) assisted in answering this question. These documents assert that the visual analogue scale (VAS) (Campbell and Lewis, 1990) is the simplest method to assess the severity of a patient's perceived pain experience. This scale is a straight line, which is graded from 'no pain' to 'worst possible pain'. Numerical/descriptive colour scales and pain faces are amongst other basic pain assessment scales. There are numerous validated multifaceted tools, which seek answers to specific questions regarding patients' perceived pain experiences, such as the McGill Pain Questionnaire (Melzack, 1975). These questionnaires can enable insight into the nature of pain and its effect on the patients' quality of life. Using pain diaries as a means of assessing how pain affects the patient may also prove useful.

Recommendations

14.1 All clinicians caring for patients with wounds should know that effective pain assessment and management is an integral component of overall wound care.
HSE Recommendation Evidence Grade: D

14.2 The clinician should undertake a comprehensive standardised wound pain assessment. The use of a pain assessment tool may be an aid in conducting this assessment of pain in patients with wounds.
HSE Recommendation Evidence Grade: C

14.3 The clinician should evaluate and document pain intensity and other characteristics of pain on a regular basis before, during and after dressing-related procedure.
HSE Recommendation Evidence Grade: D

14.4 Any change in the pattern/nature of pain or the development of a new pain experience should alert the clinician to the potential of wound complication e.g. infection.
HSE Recommendation Evidence Grade: D

14.5 The clinician should be aware that absence of pain in the presence of neuropathy can mask signs of wound complications.
HSE Recommendation Evidence Grade: D

14.6 The clinician should evaluate each patient's need for pharmacological (topical/systemic agents) and non-pharmacological strategies to treat wound-related pain.
HSE Recommendation Evidence Grade: D

Clinical Question 15: How should pain be assessed in children with a wound?

Evidence Statement

Where possible, children's self-report of their pain is the preferred approach to pain assessment, using a validated scale, for example, Wong-Baker FACES scale (Wong and Baker, 1988).

Recommendations

15.1 Where self-reporting is not possible, assess for pain in neonates and children using a validated behavioural or composite observer-rated scale.
HSE Recommendation Evidence Grade: D

15.2 Use the FLACC (Face, Leg, Activity, Cry, and Consolability) (Merkel et al., 1997) tool for children 2 months to 18 years of age.
HSE Recommendation Evidence Grade: D

15.3 Use the CRIES (Crying; Requires O_2 for Saturation >95%; Increasing vital signs; Expression; Sleepless) Scale (Krechel and Bildner, 1995) for neonates up to 6 months.
HSE Recommendation Evidence Grade: D

15.4 If pain is suspected or anticipated, use a validated pain assessment tool; do not rely on isolated indicators to assess pain. Examples of signs that may indicate pain may include changes in children's behaviour, appearance, activity level and vital signs. No individual tool can be broadly recommended for pain assessment in all children and across all contexts.
HSE Recommendation Evidence Grade: D

Clinical Question 16: What considerations need to be made in relation to wound cleansing and pain?

Evidence Statement

A practice guideline on Wound Preparation (Emergency Nurses Association, 2015) assisted in answering this question along with a guidance document on wound infection and pain (Mudge and Orsted, 2010) and a consensus document on wound cleansing and pain (WUWHS, 2004).

The process of wound cleansing and irrigation can often cause pain or discomfort for patients. There is a dearth of evidence in the literature relating to the effect of local anaesthesia on pain if used prior to cleansing and irrigation. A group of researchers (Ernst et al., 2003) conducted a randomised single blind crossover trial with 38 subjects, comparing the discomfort levels experienced by patients when exposed to warm saline (90-100°F [32.2-37.8°C]) and room temperature saline (70°F [21.1°C]), with a ten minute rest period between the exposure of the wound to each solution. The majority (63%) of patients preferred the warm solution, with 47% finding the solution soothing, 29% preferring the room temperature solution and 16% finding it soothing. The room temperature solution caused discomfort to 53% of patients, with the warm solution causing discomfort to 24% (Jones, 2012b).

Recommendations

16.1 The clinician should recognise that the cleansing solution or cleansing method may precipitate or aggravate pain.
HSE Recommendation Evidence Grade: D

16.2 The clinician should chose cleansing methods which minimise patient pain and discomfort for example the use of warm water rather than water at room temperature.
HSE Recommendation Evidence Grade: B

16.3 The clinician should consider the use of adjuncts to analgesia to manage pain during wound cleansing as required.
HSE Recommendation Evidence Grade: D

1.7 Wound Dressing and Pain

Tissue damage often occurs during the dressing change procedure and has been described by patients as the worst part of living with a wound (Mudge and Orsted, 2010). Dressing changes are a major contributor to wound pain. In patients with a wound infection whose nervous system has become sensitised, dressing removal, wound cleansing and dressing application may prove particularly painful. Analgesia may need to be timed for maximum efficacy during dressing changes and the patient may find music or some other form of distraction helpful. Even when a dressing change is managed well and the choice of dressing minimises pain, the patient's past experience of painful dressing removal may lead to increased anxiety at dressing change (Mudge and Orsted, 2010).

Non-steroidal anti-inflammatory drugs (NSAIDs) work peripherally by inhibiting the enzyme cyclooxygenase (COX). It is this enzyme, which converts arachidonic acid, released from the walls of the damaged cells, into inflammatory prostaglandins. Non-steroidal anti-inflammatory drugs provide good pain relief, but can lead to gastric ulceration, renal failure and prolonged bleeding time due to impaired coagulation.

Clinical Question 17: What considerations need to be made in relation to wound dressing and pain?

Evidence Statement

Factors that contribute to pain during the removal of a dressing include dressing materials that have dried out, aggressive adhesives, and crusted wound exudate. The repeated application and removal of dressings with traditional adhesives can create trauma on the skin surface. This may lead to stripping of the skin barrier. In the severest of cases, erythema, oedema and blistering have been observed (contact irritant and allergic dermatitis). It has been consistently shown that patients experience more pain when gauze is used to dress wounds as opposed to any type of advanced moisture-balanced dressing (Mudge and Orsted, 2010).

Recommendations

17.1 Clinicians should choose dressings that minimise trauma/pain during application and removal.

HSE Recommendation Evidence Grade: D

17.2 Clinicians should select an appropriate dressing to minimise wound-related pain based on wear time, moisture balance, healing potential and peri-wound maceration

HSE Recommendation Evidence Grade: D

17.3 Clinicians must educate the patient to seek advice/intervention if the prescribed dressing contributes to pain.
HSE Recommendation Evidence Grade: D

Clinical Question 18: What are the factors that need to be incorporated into the management of wound pain?

Evidence Statement

The following recommendations are based on consensus statements made in the 'Minimising pain at dressing-related procedures: Implementation of pain relieving strategies' (WUWHS, 2004) and a guidance document 'An Evidence-Based Care of Acute Wounds: A Perspective' (Ubbink et al., 2015), engaged a multidisciplinary team to develop evidence-based guidelines for the treatment of acute wounds for the Netherlands using the AGREE-II and GRADE instruments.

Recommendations

18.1 The clinician should endeavour to maximise wound-related pain control for every patient.

HSE Recommendation Evidence Grade: D

18.2 The clinician should consider psychosocial, local, and systemic forms of analgesic treatment in the management of patients with wounds.

HSE Recommendation Evidence Grade: B

18.3 The clinician should endeavour to involve and empower patients to optimise pain management.

HSE Recommendation Evidence Grade: D

18.4 Any pharmacological prescription should be in agreement with the patient's preference.

HSE Recommendation Evidence Grade: B

1.8 Nutrition and Wound Management

It is widely recognised that macronutrients (carbohydrates, proteins, lipids), micronutrients (vitamins and minerals) and optimal hydration play a pivotal role in the wound healing process (Stechmiller, 2010; Chow and Barbul 2014; Molnar et al., 2014; Quain and Khadori 2015). Nutrition deficiencies impede the normal processes that allow progression through specific stages of wound healing by prolonging the inflammatory phase, decreasing fibroblast proliferation and altering collagen synthesis (Stechmiller, 2010; Quain and Khadori, 2015). Studies have shown that both inadequate dietary intake and poor nutritional status correlates with pressure ulcer severity and protracted healing (Iizaka, 2010).

Nutrition in wound healing must provide adequate support for an increased energy demand during the wound healing process. Caloric needs are estimated at 30-35kcal/kg, but may need to be individualised based on overall clinical condition as determined by thorough nutritional assessment (see Clinical question 19). Adequate protein intake is essential for collagen synthesis, angiogenesis, fibroblast proliferation, immune function, tissue remodelling, wound contraction and skin structural proteins. The recommended range of protein associated with healing is between 1.25 and 1.5g/kg/day for individuals with chronic wounds; if the patient is severely catabolic, or has more than one wound, they may require greater levels of protein (Stechmiller, 2010).

Several vitamins and minerals are known to have an important role in wound healing. The literature supports a positive effect of supplementation of vitamin A in acute wounds and healing of fractures, burns and radiation-induced injury. Its role is less clear for chronic wounds (Molnar et al., 2014). Deficiency of vitamin C results in an impaired immune response and risk of wound dehiscence. Supplementation in the deficient individual is clearly beneficial; however, evidence for the use of vitamin C alone in the non-deficient patient is inconclusive (Quain and Khadori, 2015). Zinc-containing enzymes and metalloenzymes are directly involved in wound healing. A recent Cochrane review (Wilkinson, 2014) concluded that “there is currently no evidence that oral zinc preparation speeds the healing of either venous, or arterial leg ulcers although the available evidence is limited and of poor quality". Therefore, zinc supplementation is recommended only in the presence of zinc deficiency, which is commonly seen with patients who have (or are at risk of) malnutrition, diarrhoea, malabsorption, or hypermetabolic states (stress, sepsis, burns, venous ulcers, or serious injury) (Stechmiller, 2010). Arginine and glutamine are considered conditionally essential amino acids-needed in the diet only under circumstances of metabolic stress. There is inconsistent evidence supporting a direct benefit of glutamine to wound healing. As a single agent, arginine is the best-studied immunonutrient and the weight of evidence suggests that arginine is beneficial to wound healing (Chow and Barbul, 2014). The paucity of good quality clinical trials assessing the effects of nutritional therapy on wound healing, severely limits the ability to determine the optimal nutrition regimen in terms of macro and micronutrients to enhance healing. This is compounded by the fact that many of the randomised controlled trials concerning nutrition in wound care rely on combined nutritional supplements (Quain and Khardori, 2015) rather than individual

nutrients. A recent multi-centre, randomised controlled, blinded, clinical trial was conducted to determine the effect of a nutritional formula enriched with arginine, zinc, and antioxidants on the healing of pressure ulcers (PU). The authors found that among malnourished patients with grade II, III or IV PUs, 8 weeks of supplementation with an oral nutritional formula enriched with arginine, zinc, and antioxidants improved PU healing when compared with controls (Cereda et al., 2015), see clinical question 88.
Despite the lack of large clinical trials investigating specific nutrition interventions it is recommended that all patients admitted to a health care setting including those with a wound are screened for nutritional risk using a valid and reliable screening tool such as The Malnutrition Universal Screening Tool (MUST) and or the Malnutrition Screening Tool (MST). Patients identified at nutrition risk or with potential to be at risk should be referred to a registered dietitian for a complete nutritional assessment (Stechmiller, 2010). Nutritional Screening and Nutritional Assessment are defined below.

Nutrition Screening
Nutrition screening is the first step that all healthcare professionals can perform to identify patients who may be at nutrition risk or potentially at risk and who may benefit from appropriate nutrition intervention led by a registered dietitian (BAPEN, 2003).

Nutrition Assessment
Nutritional assessment should be performed by a registered dietitian in all patients identified as being at risk by screening. Registered dietitians perform a comprehensive nutrition assessment which is step 1 in the Nutrition Care Process and Model (NCPM), a systematic approach to providing high quality nutritional care as outlined below (AND, 2003):

- **Nutrition Assessment:** The registered dietitian collects and documents information such as food or nutrition-related history; biochemical data, medical tests and procedures; anthropometric measurements, nutrition-focused physical findings and patient history
- **Diagnosis:** Data collected during the nutrition assessment guides the registered dietitian in selection of the appropriate nutrition diagnosis (i.e., naming the specific problem)
- **Intervention:** The registered dietitian then selects the nutrition intervention that will be directed to the root cause (or aetiology) of the nutrition problem and aimed at alleviating the signs and symptoms of the diagnosis
- **Monitoring/Evaluation:** The final step of the process is monitoring and evaluation, which the registered dietitian uses to determine if the patient has achieved, or is making progress toward, the planned goals

Certain recommendations in this section draw on NICE guidance:

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Clinical Question 19: How should nutritional status be assessed in patients with wounds?

Evidence Statement

There is a large body of evidence demonstrating the essential role of nutrition in wound healing. The following recommendations are based on evidence taken from the following guidelines and literature

- Expert Guide for Healthcare Professionals: Nutrition and Wound Healing (Wounds Australia, 2009),
- Nutrition and Wound Healing Guidelines Summary (Queensland University of Technology, 2015)
- Nutrition and Chronic Wounds (Molnar et al., 2014)
- A review of nutritional assessment tools (Golladay et al., 2016)
- Evidence from a large multi centre observational trial (Roberts, 2014) and a review of nutrition and wound healing (Stechmiller, 2010) were also used in answering this question.

Nutrition plays an essential role in wound healing. Malnutrition is linked with delayed wound healing and increased rates of hospital acquired infections. It has also been identified as a factor for increased surgical site infections, prolonged hospital stay and readmission rates. Improving the patients overall nutritional status enables the body to heal wounds, which is seen in cases of accelerated wound healing with nutritional supplementation (Molnar et al., 2014). Clinicians should be aware that people at risk of malnutrition are also at increased risk of developing pressure ulcers and delayed wound healing (NPUAP/EPUAP/PPPIA, 2014). It is essential to consider relevant nutrition related risk factors (e.g. diabetes, hypertension, hyperlipidaemia, obesity and under-nutrition) when assessing the nutritional status of a patient with wounds (Irish Nutrition and Dietetic Institute, 2015).

Recommendations

19.1 Screen the nutritional status of all patients at risk or with a wound or pressure ulcer.

HSE Recommendation Evidence Grade: D

19.2 Nutrition screening should take place within 24 hours of admission to a health care setting.

HSE Recommendation Evidence Grade: C

19.3 Nutritional screening should be done:

- with each significant change of clinical condition and/or
- when progress toward wounds closure is not observed

HSE Recommendation Evidence Grade: D

19.4 Nutritional screening should be repeated weekly for inpatients and outpatients with wounds in the acute setting when there is clinical concern. For the community setting screening should be repeated at least 1-3 monthly or in line with local policy.
HSE Recommendation Evidence Grade: C

19.5 Refer individuals screened to be at risk of malnutrition and or individuals with existing pressure ulcers to a registered dietitian or an inter-professional nutrition team for a comprehensive nutritional assessment.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =☝(NPUAP/EPUAP/PPPIA 2014:79)

19.6 Nutrition assessment is an essential component in the prevention and management of wounds. It is performed by a registered dietitian.
HSE Recommendation Evidence Grade: D

19.7 A comprehensive nutritional assessment by a registered dietitian should assess additional risk factors (obesity, diabetes, acute injury, degree of weight loss, chronic liver disease, arthritis, excess alcohol intake, inflammatory disease, age, renal function, vascular disease, cognition, socio-economic factors) to formulate an individualised nutrition care plan to optimise wound healing.
HSE Recommendation Evidence Grade: C

19.8 The registered dietitian should be able to calculate the caloric needs of a patient with a wound incorporating the person's age, comorbidities, body weight, activity level, biochemical parameters, stage of healing, wound size, exudate volume, number and severity of wound.
HSE Recommendation Evidence Grade: C

19.9 The registered dietitian should also consider factors affecting nutritional intake (independence to eat, nausea, bowel function, polypharmacy, meal timings, protected mealtimes), as well as estimated nutrient intake and liaise with the multidisciplinary (MDT) as indicated to optimise nutritional intake to meet individualised requirements and nutritional goals.
HSE Recommendation Evidence Grade: B

19.10 The registered dietitian should assess a patient's need for other therapeutic diets, and rationalise accordingly.
HSE Recommendation Evidence Grade: C

19.11 The fluid intake of a person with wounds should be closely monitored.
HSE Recommendation Evidence Grade: D

19.12 The nutritional status of patients with high levels of wound exudate should be assessed and monitored, with particular attention paid to hydration status.
HSE Recommendation Evidence Grade: D

Good Practice Point
A referral to a registered dietitian should be sent if the patient is identified at risk of malnutrition and/or experiencing delayed wound healing.

Clinical Question 20: How should nutritional deficiency be addressed in patients with wounds?

Evidence statement

It is prudent for clinicians involved in the management of acute and chronic wounds to optimise nutritional status. Consideration should be given to correct provision of macronutrients, micronutrients and water. This should be done in the context of the patient's current dietary intake, preferences and overall clinical condition. While certain nutrients such as amino acids and antioxidants have been shown to positively influence wound healing, strong evidence to supplement a patient's diet with specific nutrients is lacking (Chow and Barbul, 2014; Quain and Khardori 2015). Due to lack of evidence for other wound types in clinical practice nutritional requirements for pressure ulcers are typically used in the management of all non-healing wounds. The Recommended Daily Allowance (RDA) for micronutrients is available from the Food Safety Authority and is used in practice in the Republic of Ireland:
https://www.fsai.ie/assets/0/86/204/fb3f2891-2896-4bf9-903f-938f3c2ad01f.pdf

Existing guidance documents describing management of nutritional deficiency in patients with wounds and /or who have identified nutritional deficiencies (NICE, 2006 and NPUAP/EPUAP/PPPIA, 2014) as well as a review on the role of nutrition in wound healing (Thompson and Fuhrman, 2005) were considered when formulating recommendations. The nutritional requirements for optimal healing of all wounds are outlined below.

Recommendations

20.1 Aim to provide 30-35kcal/kg/day to promote wound healing.
HSE Recommendation Evidence Grade: D

20.2 Aim to provide between 1.25 and 1.5g of protein/kg/day.
HSE Recommendation Evidence Grade: D

20.3 Offer 1.25 to 1.5g of protein/kg/body weight for adults with an existing pressure ulcer who are assessed to be at risk of malnutrition when compatible with goals of care, and reassess as condition changes.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = B; Strength of Recommendation =👍*(NPUAP/EPUAP/PPPIA 2014:82)*

20.4 For severely catabolic patients or those with more than one wound, protein levels as high as 1.5g/kg/day to 2g/kg/day may be necessary.
HSE Recommendation Evidence Grade: D

20.5 Renal function should be considered when determining appropriate protein requirements.
HSE Recommendation Evidence Grade: D

20.6 For obese patients, an individualised approach should be considered when determining their caloric goals.
HSE Recommendation Evidence Grade: C

20.7 Ensure adequate water provision for perfusion and oxygenation of healthy and healing tissues. Aim for 30ml/kg or 1 to 1.5ml/kcal consumed.
HSE Recommendation Evidence Grade: D

20.8 Aim to provide the RDA for micronutrients.
HSE Recommendation Evidence Grade: D

20.9 Nutrition support should be considered in people at risk of malnutrition, defined as those who have:

- Eaten little or nothing for more than 5 days and/or are likely to eat nothing for 5 days or longer
- A poor absorptive capacity and/or high nutrient losses, and/or increased nutritional needs from causes such as catabolism.

HSE Recommendation Evidence Grade: C

20.10 Nutrition support should be considered in people who are malnourished as defined by any of the following:

- A body mass index (BMI) of less than 18.5kg/m^2
- Unintentional weight loss of greater than 10% within last 3-6 months
- A BMI of less than 20kg/m^2 and unintentional weight loss greater than 5% within last 3-6 months.

HSE Recommendation Evidence Grade: C

20.11 Healthcare professionals should consider using oral, enteral or parenteral nutrition support, alone or in combination, for people who are malnourished or at risk of malnutrition as defined above. Potential swallowing problems need to be taken into account.
HSE Recommendation Evidence Grade: C

20.12 For patients with established deficiency and pressure ulcers offer fortified foods and / or high calorie, high protein oral nutritional supplements between meals if nutritional requirements cannot be achieved by dietary intake.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = B; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:81)

See clinical question 19 for other nutritional considerations.

20.13 Consider using a supplement that contains high protein, arginine and micronutrients for adults who are malnourished with a pressure ulcer Category/Stage III or IV or multiple ulcers for at least 8 weeks.
HSE Recommendation Evidence Grade: A

20.14 If there is concern about the adequacy of micronutrient intake, a complete oral multivitamin and mineral supplement providing the reference nutrient intake* for all vitamins and trace elements should be considered by health care professionals with the relevant skills and training in nutrition support who are able to determine the nutritional adequacy of the patients intake.
HSE Recommendation Evidence Grade: C

**RDA's are used in the Republic of Ireland instead of the reference nutrient intake for micronutrient requirements*

20.15 There is insufficient evidence to support routine micronutrient supplementation (above RDA or as a pharmacological dose) in the absence of deficiency.
HSE Recommendation Evidence Grade: D

20.16 Targeted micronutrient supplementation should consider current intake, additional losses, clinical condition and safe upper limits.
HSE Recommendation Evidence Grade: D

Clinical Question 21: What factors should be considered in the treatment of morbidly obese patients with wounds?

Evidence Statement

Data from the Healthy Ireland Survey, 2015 showed that 23% of the Irish population aged 15yrs and over are obese. The definition of morbid obesity is a BMI >40kg/m^2. However, the factors for consideration listed below may also apply to those with class 1 obesity (BMI 30-34.9) and class 2 obesity (BMI 35-39.9). A multi-centre prospective cohort study (Thelwall et al., 2015), a retrospective study (Whiting et al., 2017) and two literature reviews (Beitz, 2014; Pierpont et al., 2014) addressed this question. From these studies, it is evident that obesity complicates the healing of surgical wounds, as well as being a risk factor for the development of post-operative complications. These complications may arise due to a number of anatomical and physiological manifestations associated with obesity, such as deep skin folds, poor vascularisation, alterations in immune response and nutritional deficiencies. Although these challenges are well recognised, the exact mechanism for how these arise is not well understood, indicating that further research is required.

Those caring for morbidly obese patients with wounds should receive training. This training should involve both the healthcare professional and patient, and should address physical aspects of care, including attention to skin cleansing and odour management, with specific attention to skin folds and peri-genital area, as well as pressure redistribution and access to appropriate bariatric equipment (Bietz, 2014; NPUAP/EPUAP/PPPIA, 2014).

Consideration should also be given to the psychological health of these patients, including dignity, self-image and psychosocial challenges that are associated with obesity (Beitz, 2014). All obese patients should be referred to a registered dietitian for a comprehensive nutritional assessment (NPUAP/EPUAP/PPPIA, 2014) as obese and morbidly obese persons can be markedly malnourished (Beitz, 2014). Obese patients suffer from a paradoxical malnutrition resulting from a calorie-dense diet that is high in carbohydrates and fats and low in vitamins and minerals. There is a high occurrence of both macronutrient and micronutrient deficiencies in the obese, in particular protein, vitamin B12, vitamin D, zinc, and iron (Pierpoint et al., 2014).

Obese patients should aim for weight maintenance during wound healing and should not aim for weight loss until their wound is fully healed (Wounds Australia, 2009). It is therefore essential that nutritional requirements for obese patients are calculated using obesity specific equations (PENG, 2011 and Choban, 2013). Obesity is also strongly linked to diabetes and insulin resistance, both of which can delay wound healing if glycaemic control is not optimised. In those with diabetes or impaired glucose tolerance, strict glycaemic control should be established (Thelwall et al., 2015, Wounds Australia, 2009). Obesity is believed to account for 80-85% of the risk of developing type 2 diabetes (BMJ, 2015).

Recommendations

21.1 The clinician should assess patients who are obese for their risk of wound dehiscence, wound infection and major/minor complications.
HSE Recommendation Evidence Grade: A

21.2 The clinician should base the management plan on the outcome of the risks identified from the assessment.
HSE Recommendation Evidence Grade: A

21.3 Refer bariatric individuals to a registered dietitian or an inter-professional nutrition team for a comprehensive nutritional assessment and weight management plan.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:204)

21.4 When calculating nutritional requirements for obese patients, equations specific to this patient group should be utilised.
HSE Recommendation Evidence Grade: C

21.5 Aim for weight maintenance during wound healing; obese patients should not try to lose weight until their wound has completely healed.
HSE Recommendation Evidence Grade: C

21.6 Provide pressure ulcer distribution surfaces and equipment appropriate to the size and weight of the individual.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:202)

21.7 In obese patient with wounds and diabetes or impaired glucose tolerance, glycaemic control should be optimised.
HSE Recommendation Evidence Grade: B

1.9 Paediatric Nutrition and Wound Management

There is little published evidence available for the nutritional management of paediatric wounds, despite the prevalence being reported at between 16-27% of neonates and children admitted to paediatric and neonatal ICU's (Baharestani 2007; EPUAP/NUPAP/PPPIA 2014; Wounds UK 2014). Current best practice for nutritional management in paediatric wound care relies on small retrospective or case control studies, adult research and expert opinion, or is extrapolated from other conditions such as burns, pressure ulcers and Epidermolysis Bullosa (EB) (Shaw, 2015) The aim of nutritional support in infants and children with wounds, or those who are at risk of developing pressure ulcers, is to optimise nutritional status, promote wound healing and achieve adequate growth.

Clinical Question 22: How should nutritional status be assessed in children with wounds?

Evidence Statement

Paediatric nutrition screening tools are not routinely used in paediatric hospitals (White, 2014). In addition, whilst there are some tools used for paediatric pressure ulcer risk assessment, there is a need for more research to determine their effectiveness (Anthony, 2017)

Recommendations

22.1 An age-related nutritional assessment should be completed on neonates, infants, children and young people with a wound. This should be performed by a paediatric dietitian with the necessary skills and competencies.
HSE Recommendation Evidence Grade: D

22.2 Children considered to be at risk of developing a pressure ulcer should be assessed on admission (within 24 hours) and reviewed after seven days and regularly thereafter.
HSE Recommendation Evidence Grade: D

Clinical Question 23: How should nutritional deficiency be addressed in children with wounds?

Evidence Statement

In children with wounds, a complete nutritional assessment should identify nutritional deficiencies as a result of inadequate nutrition. A reduction in nutritional intake may be multifactorial, but should take into account the infant's or child's age, medical condition, previous weight, previous growth velocity, body mass index, duration of reduced intake and supplemental feeding (Wilcock, 2008). In children, particularly infants, the need for continued growth and lower caloric reserves (Rodrigues-key, 2007) can affect the ability to sustain adequate nutrition, therefore additional energy and protein is required to promote wound healing and achieve adequate growth.

Estimation for energy requirements for children with wounds are often based on requirements for the treatment of burn injuries or chronic illness such as Epidermolysis Bullosa (EB). The NICE guidelines (2014) address management of nutritional deficiency in children with pressure ulcers.

Certain recommendations in this question draw on NICE guidance:

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NICE guidance is prepared for the National Health Service in England. It is subject to regular review and updating and may be withdrawn. NICE accepts no responsibility for the use of its content in this product/publication.'

Recommendations

23.1 Energy requirements can vary depending on the size of the ulcer or wound, relative to body size and age of the infant or child. Equations to determine energy requirements can be utilised in the first instance and adjusted based on the patients response.
HSE Recommendation Evidence Grade: D

23.2 The evidence in relation to protein requirements remains unclear. However, in practice requirements are usually calculated at 115-200% of reference nutrient intake for age, or between 1.5g-4.0 g/kg.
HSE Recommendation Evidence Grade: D

23.3 Supplementation with vitamins and minerals should be considered based on biochemical indices and the overall clinical picture.
HSE Recommendation Evidence Grade: D

23.4 Discuss with a registered paediatric dietitian whether to offer nutritional supplements to correct nutritional deficiency in neonates, infants, children and young people with a pressure ulcer.
HSE Recommendation Evidence Grade: C

23.5 Ensure there is adequate hydration for age, growth and healing in neonates, infants, children and young people. If there is any doubt, seek further medical advice.
HSE Recommendation Evidence Grade: D

Clinical Question 24: What factors should be considered in the treatment of overweight/obese children with wounds?

Evidence Statement

It is recognised that children who are overweight/obese may experience a reduction in mobility, as well as compromised nutritional status, and thus an increase pressure ulcer risk (Dyer, 2010). Reduced energy intakes is a feature of many chronic illnesses or disorders which increases the risk of obesity (Rodrigues-key, 2007), therefore energy requirements should be calculated based on equations that take into account basal energy expenditure and clinical condition (Shaw, 2015).

Good Practice Point

An individualised nutrition care plan pertinent to their specific needs and goals is required for overweight/obese children with wounds.

1.10 Wound Cleansing

Wound cleansing has been defined as a process to "remove surface contaminate, bacteria and remnants of previous dressings from the wound surface and its surrounding skin"(Rodeheaver and Ratliff, 2007). Wounds need to be cleaned where exudate is infected, foreign bodies are present and/or when gross contamination by dirt or bacteria has occurred (Cutting, 2010). Appropriate wound cleansing will ensure that all pathogens are effectively removed while no further damage is caused. Water is a well-documented and acceptable form of wound cleansing; however, individual circumstances should be considered when determining the most appropriate choice of cleaning agents for optimal healing (Cutting, 2010). The use of Aseptic Non-Touch Technique is now widely accepted as the standard of excellence for aseptic technique. Aseptic Non-Touch Technique refers to the technique and precautions used during clinical procedures to protect the patient from infection by preventing the transfer of micro-organisms to the patient from the clinician, equipment or the environment (The Association for Safe Aseptic Practice, 2017). Aseptic Non-Touch Technique is a specific type of aseptic technique with a unique theory and practice framework (NICE, 2012) and its principles are intended for use in a range of settings from the operating theatre to the community. The key underpinning principles of Aseptic Non-Touch Technique are:

- always decontaminate hands
- maintain asepsis of key parts of equipment and materials
- maintain asepsis of key sites e.g. wounds, by protecting against contamination by micro-organisms
- touch non key parts with confidence
- take appropriate infection prevention precautions e.g. PPE (need to write in full), waste disposal

Optimum wound cleansing should be conducted under Aseptic Non Touch Technique, although there are occasions when clean technique can be applied.

Refer to appendix VI for Aseptic Non-Touch Technique regimen to be applied to wound management.

Clinical Question 25: What are the indications for methods, timing and/or frequency of wound cleansing?

Evidence Statement

A Cochrane Systematic Review by (Fernandez and Griffiths, 2012) a literature review by Cutting (2010) and a regional guideline from the Netherlands (Ubbink et al., 2015) assisted in answering this question. Numerous different wound-cleansing agents are recommended within the literature, with many comparative studies attempting to establish the most efficacious wound-cleansing agent. A Cochrane review (Fernandez and Griffiths, 2012) concluded that there is no evidence that the use of tap water to cleanse acute wounds in adults increases infection. In the absence of tap water, water that is boiled and then cooled or distilled water can be used as wound cleansing agents.

Recommendations

25.1 The timing, frequency and type of solution for wound cleansing is based on the individualised wound assessment findings and plan of care.
HSE Recommendation Evidence Grade: D

25.2 Wounds that are closed under aseptic conditions should not require further cleansing and disinfection.
HSE Recommendation Evidence Grade: C

25.3 Cleanse surgical wounds healing by secondary intention with sterile Normal Saline (0.9%) or Sterile Water.
HSE Recommendation Evidence Grade: D

25.4 Potable water is acceptable for wound cleansing.
HSE Recommendation Evidence Grade: D

25.5 In the absence of drinkable water, boiled and cooled water, or distilled water can be used as wound cleansing agents.
HSE Recommendation Evidence Grade: A

25.6 To ensure debris is removed and to allow visual examination wound irrigation is considered to be the most effective way of cleaning a wound
HSE Recommendation Evidence Grade: D

25.7 No specific recommendation can be made about the precise force required for wound irrigation as there is no consensus within the literature.
HSE Recommendation Evidence Grade: D

25.8 The use of disinfectants is not recommended in the cleansing of wounds.
HSE Recommendation Evidence Grade: C

25.9 Contaminated wounds (e.g. bites) should be cleansed with Normal Saline 0.9% solution, by means of gentle irrigation using strict aseptic technique.
HSE Recommendation Evidence Grade: D

Clinical Question 26: How should the practice of Aseptic Non-Touch Technique be conducted?

Evidence Statement

The following recommendations are based on: 'The ANTT Clinical Practice Framework for all invasive Clinical Procedures from Surgery to Community Care' (Aseptic Non-Touch Technique, 2015).

Please see appendix VI for further guidance on Aseptic Non- Touch Technique.

Recommendations

26.1 Aseptic Non-Touch Technique should be applied based on risk assessment of the patient and the wound.

HSE Recommendation Evidence Grade: D

26.2 Clinicians should be aware of the practices required to prevent patients acquiring a healthcare-associated infection.

HSE Recommendation Evidence Grade: D

1.11 Wound Dressing

Clinical Question 27: What is the role of dressings in the management of wounds?

Evidence Statement

Wound dressings play a pivotal role in the wound healing process and in achieving an optimal moisture balance with the wound. The main objective for wound management is to eliminate/control all factors that prevent healing and to develop and maintain conditions that enhance healing. Wound dressings have evolved from simple gauze and Vaseline based products and are now numerous, sophisticated and complex. Selection of the right product for a wound is dependent on the clinician's knowledge, skill and understanding of both the product and the wound. The correct choice of dressing can have a significant impact on wound healing (Casey, 2000) and should be selected based on a comprehensive wound assessment and patient preference.

In acute wounds healing by secondary intention with the presence of dead or devitalised tissue, debridement can be enhanced by a process known as autolysis, which is enzymatic digestion of the devitalised tissue. The overall goal in the management of acute wounds is to provide an optimal wound healing environment, with little disturbance to the wound thereby reducing the risk of bacterial contamination. Inappropriate use of dressing products may result in delayed healing of the wound and damage to the surrounding skin. Traditionally, the management of chronic wounds has been related to physiological processes involved in the healing of acute wounds. However, acute wounds usually follow an orderly progression from initial injury to complete closure and scar formation (Nicks et al., 2010). These wounds are covered with a low-adherent island dressing for the first 24hrs to 48hrs and are then left exposed. Simple post-operative dressings that provide protection and the ability to manage minimal exudate are the dressings of choice for these wounds.

The chronic wound differs greatly from the acute wound; the biological processes involved are disordered and healing occurs on a slower timescale than that of the acute wound (Guo and DiPietro, 2010). The chronic wound compared with the acute wound, is characterised by the exhibition of a number of factors that contribute towards non-healing:

- high levels of proteases
- bacterial colonisation / infection
- chronic inflammation
- disordered growth factor profiles
- defective granulation tissue
- inhibited re-epithelialisation

The chronic wound will not progress to healing until the biomolecular environment is corrected. Often the dressing choice is based on the ability of the dressing to manage exudate; however, the need to consider other important functions of the wound dressings such as debridement and infection control is fundamental to the process.

In the clinical setting, it is imperative that the right treatment is selected for the patient as failure to do so may result in delayed outcomes and increased suffering for the patient. However, this is not always an easy process and decision making becomes even more complex when there are a large number of potential treatment choices available. Use of a model of care such as the TIME framework, can enable the clinician to use critical thinking skills in care planning (Leaper et al., 2012). However, even with use of TIME, the vast number of decisions need to be made; for example, whether to debride, what sort of debridement, what dressing to choose and how frequently the dressing should be changed, meaning that the clinician may have to choose from 48 possible actions.

Recommendations

27.1 Dressings should be used as part of a treatment plan and based on comprehensive wound and patient assessment whilst supporting the management of any underlying clinical condition which the patient may have.
HSE Recommendation Evidence Grade: D

27.2 When considering dressing choice, the clinician must consider the activity/mobility level of the patient, the position of the wound, the anatomical fit of the dressing, condition of the surrounding skin and the method for securing the primary and secondary dressings in the decision-making process.
HSE Recommendation Evidence Grade: D

27.3 Some primary dressings can be applied without the need for secondary dressings whilst others will require secondary dressings, the clinician must consider if the primary and secondary dressings are compatible.
HSE Recommendation Evidence Grade: D

1.11.1 Wound Dressing Classification

Wound dressings are adjunctive and have specific functions that address specific needs. Inappropriate use of dressings may lead to unwanted effects. Dressings influence the wound environment. They are classified as **Passive**, **Interactive** or **Advanced wound care products.**

- **Passive:** Simple dressings for protection of the wound bed e.g. post-operative surgical pads
- **Interactive:** Dressings that contain substances that interact with the wound e.g. hydrocolloids
- **Advanced wound care products:** Products that interact with and advance wound healing especially in the complex and challenging wounds e.g. Negative Pressure Wound Therapy (NPWT), Larval Therapy and antimicrobial products

Clinical Question 28: How can the clinician choose the most appropriate dressing for a wound?

Evidence Statement

The optimal conditions for wound healing are provided by dressings that create and maintain a moist environment. Moisture under occlusive dressings not only promotes the inflammatory phase of healing through presence of moisture and an initially low oxygen tension, but also increases the rate of epithelialisation. Conversely, gauze does not exhibit these benefits; it may corrupt wound healing as it dries and cause tissue damage when removed. Use of occlusive dressings is also thought to be advantageous, as these dressings maintain the optimal level of exudate at the wound surface. This exudate is rich in cytokines and proteins necessary for wound healing, and is thus very important. To date, there have been no reports of increased risk of wound infection with use of occlusive dressings (Jones et al., 2006).

A 2017 NICE evidence statement “Wound care products” addresses the challenges in selecting particular wound dressings. These guidelines, while giving important recommendations about wound care, do not make specific recommendations on wound healing products. Overall, the decision making process is challenged by the lack of robust evidence to support or refute the use of different dressings. The National Institute for Health and Clinical Excellence (2016) concludes that although there is some evidence that modern or advanced dressings such as hydrocolloids, alginates and hydrofibre dressings are more clinically effective than conventional dressings (such as paraffin gauze) for treating wounds, there is insufficient evidence to promote one above the other.

There are no single agreed set of criteria for assessing the efficacy and quality of wound dressings. When selecting the dressing/product, wound-related factors e.g. wound aetiology, duration, tissue type, exudate, size, depth, exudates and treatment objectives should be assessed and documented as part of the comprehensive wound assessment. The clinician should also know the characteristics of the ideal dressings; for example:

- capable of maintaining a high humidity at the wound site while removing excess exudate
- free of particles and toxic wound contaminants
- non-toxic and non-allergenic
- capable of protecting the wound from further trauma
- can be removed without causing trauma to the wound and peri-wound/patient
- impermeable to bacteria
- thermally insulating
- will allow gaseous exchange
- comfortable and conformable
- require only infrequent changes
- cost effective and efficient
- long shelf life (Jones et al., 2006)

Recommendations

28.1 In the absence of strong clinical or cost effective evidence, clinicians should choose wound dressings that:

- have performance characteristics appropriate for the wound and its phase of healing
- meet patient acceptability
- best match their clinical experience
- have the lowest acquisition cost

HSE Recommendation Evidence Grade: B

28.2 The clinician caring for the patient and their wound should recognise their accountability in ensuring an appropriate management plan for the patient throughout the trajectory of the care delivery.

HSE Recommendation Evidence Grade: D

28.3 When applying dressings to wounds the clinician should understand indications and contraindications of the selected dressings and ensure adherence to manufacturers guidelines.

HSE Recommendation Evidence Grade: D

28.4 Dressing selection and frequency of dressing change and reassessment should be based on comprehensive wound assessment and desired treatment outcomes.

HSE Recommendation Evidence Grade: D

28.5 Wound exudate should be reassessed at each dressing change to determine whether the product and the wear-time of the chosen dressing remain appropriate.

HSE Recommendation Evidence Grade: D

28.6 Dressings removed from the wound should be observed as part of the assessment and the amount, colour, consistency and odour of the exudate should be noted.
HSE Recommendation Evidence Grade: D

Refer to appendix VII for a guide on adult and paediatric dressing selection.

28.7 The skin surrounding a highly exuding wound may be further protected through the use of emollients or the application of barrier films.
HSE Recommendation Evidence Grade: D

28.8 Avoid the use of a highly absorptive dressing on dry wounds as they may lead to disruption of healthy tissue on the wound surface and cause pain when removed.
HSE Recommendation Evidence Grade: D

Good Practice Point
The clinician should ensure they have up to date, knowledge, skills and competence in choosing the right product for the right wound at the right time.

Good Practice Point
To assist in selecting an appropriate wound dressing clinicians should consult their local formulary where available. The Journal of Wound Care Handbook (updated annually) is an excellent resource and can be found at: www.woundcarehandbook.com.

Clinical Question 29: Are dressings indicated in the prevention of surgical site infection in wounds healing by primary intention?

Evidence Statement

A Cochrane review concluded that *"It is uncertain whether covering surgical wounds healing by primary intention with wound dressings reduces the risk of SSI, or whether any particular wound dressing is more effective than others in reducing the risk of SSI, improving scarring, reducing pain, improving acceptability to patients, or is easier to remove"* (Dumville et al., 2016).

Good Practice Point

Decisions about how to dress a wound following surgery should be based on the patient and wound assessment, the care plan, the patient's preference and comfort and cost of the dressing.

1.12 Advanced Wound Dressings: Antiseptics and Antimicrobial Dressing Products

Infections are among the most common complications of non-healing wounds. They can impede the process of healing, resulting in longer treatment times and increased use of resources. In severe cases, infections can result in amputation or life threatening conditions. Wounds become prone to infection as they provide a moist, warm and nutrient-rich environment that is ideal for microbial colonisation and proliferation. As a result, the use of antimicrobials is important in wound management. Conversely, the misuse of antimicrobials can cause microbial colonies to become resistant to these antibiotics and can significantly jeopardise the patients' health status (Gottrup et al., 2014).

Inappropriate or over-use of systemic antibiotics is a concern for clinicians. Alternatives to the use of antibiotics such as antimicrobial wound dressings are continuously being sought. However, these alternatives need to be clinically effective. Despite the plethora of research into the management of wound infection, the focus is on treating infections rather than pro-actively treating to avoid infection. This latter objective may be described as the best approach in terms of reduced morbidity and costs for patient quality of life. It becomes evident that a framework is required for the early recognition of factors that might lead to infection. An awareness of increasing wound bioburden, of colonisation with specific pathogens and recognition of clinical signs and symptoms that herald incipient infection is essential for success (Gray, 2004). Please refer to *section 1.4* on bioburden for comprehensive guidance on this topic.

Prescribers should have access to and follow the national antimicrobial prescribing guidelines to ensure that patients are prescribed antimicrobial medication appropriately. The choice of antimicrobial medication is also guided by the persons' clinical condition and or the results of microbiology testing where applicable. . Further information relating to the prescribing of antibiotics and antibiotic stewardship can be found at www.antibioticprescribing.ie, http://www.hpsc.ie/ and https://www.hiqa.ie.

ALERT!
The term 'antimicrobial' refers to disinfectants, antiseptics and antibiotics.

Use antiseptics at the lowest effective concentration to minimise harm to skin and tissue cells involved in wound healing and according to manufacturer's instructions.

Clinical Question 30: What are the indications, timing and frequency of use of antiseptics/antimicrobials dressings in the management of wounds?

Evidence Statement

The indications for prescribing systemic antibiotics for wound infections are relatively well understood, although the appropriate selection of topical antimicrobial agents is less clear. The antimicrobial agents used in wound care can generally be divided into antibiotics and antiseptics/antimicrobials. Gottrup et al. (2014) outline that antibiotics are enterally or parenterally administered to patients, and can be transported through the blood or lymphatic system to other parts of the body, whereas antiseptics/antimicrobials (and a few antibiotics when applied locally) are confined to local topical use. Further, Gottrup et al. (2014) suggest that antimicrobial preparations used in wound care should possess a broad spectrum of antimicrobial activity and be fast acting and stable without selecting for resistant strains. These agents should not be cytotoxic to host tissue, induce adverse effects, possess mutagenicity, be carcinogenic, prolong wound healing, nor be expensive. Achieving a balance between potential harm versus potential benefit can be challenging, however, in the use of a topical antimicrobial agent ideally, the choice should be one that offers inhibition of a wide range of potential pathogens without causing significant harm to the individual.

Recent advances in antiseptic technology have led to the development of a number of products that are less harmful to healthy tissues, while being highly effective in destroying pathogens. These include antiseptics such as silver, cadexomer iodine, polyhexamethyl biguanide (PHMB) and honey (Wounds International, 2011). The use of super-absorbants to sequester bacteria and dressing products that incorporate dialkylcarbamoylchloride (DACC) technology may also be considered (Vowden and Vowden, 2011).

Refer to *appendix VII* for guidance on dressing selection.

Recommendations

30.1 The clinician must recognise that to justify the use of topical and local antimicrobial treatments in non-healing wounds, the endpoints should primarily be resolution of infection.
HSE Recommendation Evidence Grade: D

30.2 Clinicians are advised to use antiseptics/antimicrobials at the lowest effective concentration to minimise harm to skin and tissue cells involved in wound healing.
HSE Recommendation Evidence Grade: C

30.3 Topical antibiotics are not recommended for general management of wound infection.
HSE Recommendation Evidence Grade: C

30.4 When clinicians use a topical antiseptic/antimicrobial, further evaluation is required. An individual topical antiseptic/antimicrobial should be used for no longer than two weeks. The clinician must assess the wound and the effectiveness of the therapy at each dressing change for efficacy of use.
HSE Recommendation Evidence Grade: D

30.5 The clinician should consider monitoring thyroid function in the following patients who are treated with iodine dressings, due to possible systemic uptake of iodine:

- Patients with thyroid disease
- Patients with known or suspected iodine sensitivity
- Pregnant or breastfeeding women
- Newborn babies and up to the age of six months

HSE Recommendation Evidence Grade: D

Refer to section 1.4 for additional guidance on the management of bioburden.

Good Practice Point
The use of topical antimicrobials should be based on comprehensive assessment, identification of risk factors and the treatment goals.

Clinical Question 31: Is there evidence to support the use of antimicrobial dressings in the acute surgical (closed) wound?

Evidence Statement

A Cochrane review "Topical antibiotics for preventing surgical site infection in wounds healing by primary intention" by Heal et al. (2016) addressed this question.

The authors were unable to conclude if the effects of topical antibiotics had adverse outcomes. Additionally, the relative effects of different topical antibiotics were found to be unclear.

Good Practice Point:

There is insufficient evidence to make a definitive recommendation regarding the use of topical antibiotics in primary intention healing wounds.

Clinical Question 32: Is there evidence to support the use of antibiotics or antimicrobial dressings in wounds healing by secondary intention?

Evidence Statement

The Cochrane Review, 'Antibiotics and antiseptics for surgical wounds healing by secondary intention' (Norman et al., 2016) found that there is no robust evidence on the relative effectiveness of any antiseptic/antibiotic/antibacterial preparation evaluated to date for use on surgical wounds healing by secondary intention.

Good Practice Point

The clinician must base their decision on a comprehensive wound assessment and desired outcome for the patient and their wound.

Clinical Question 33: Is there evidence to support the use of antimicrobial dressings in chronic wounds?

Evidence Statement

An evidence summary on antimicrobials by NICE (2016a) and EWMA (Gottrup et al., 2014) address this question. The National Institute for Health and Care Excellence (2016a) reports that currently there is no robust clinical or cost-effectiveness evidence to support the use of antimicrobial dressings (e.g. silver, iodine or honey) over non-medicated dressings for prevention or management of chronic wounds. The National Institute for Health and Care Excellence (2016) discourages indiscriminate use of antimicrobial dressings because of concerns over resistance to bacteria and toxicity. Antimicrobial dressings may be considered to help reduce bacterial numbers in wounds, but should be avoided unless the wound is infected or there is a risk of the wound becoming infected. A EWMA report "Antimicrobials and Non-healing Wounds" (Gottrup et al., 2014) states that there is little evidence to support the use of antibiotic or antiseptic topical treatments to prevent wound infection, particularly in diabetic foot ulcers.

Recommendations

33.1 Indiscriminate use of antimicrobial dressings should be discouraged because of concerns over bacterial resistance and toxicity.
HSE Recommendation Evidence Grade: D

33.2 Antimicrobial dressings may be considered to help reduce bacterial numbers in wounds, but should be avoided unless the wound is infected or there is a clinical risk of the wound becoming infected.
HSE Recommendation Evidence Grade: D

33.1 The use of topical antiseptics or antibiotics to prevent wound infection should be avoided.
HSE Recommendation Evidence Grade: C

33.3 Patients presenting with a clinical picture of localised or spreading wound infection should be considered for treatment with a topical antiseptic agent or an antimicrobial dressing.
HSE Recommendation Evidence Grade: D

33.4 The use of multiple, combined antimicrobial products should be avoided.
HSE Recommendation Evidence Grade: D

1.13 Medical Adhesive-Related Skin Injury (MARSI)

When medical adhesives are removed from the skin, there is a risk of accidentally removing some of the superficial layers of the skin, or in some cases, of causing deeper tissue damage. In the International 2010 Skin Tear survey (LeBlanc, 2011), dressing removal was cited as one of the top causes of skin tear. This type of injury causes pain for the patient and can increase the risk of complications such as infection, delayed wound healing and reduction in health related quality of life. Often while these injuries can be thought of as being relatively minor, they still require the same care and attention that would be given to any wound as the impact on the patient can be significant (Cutting, 2008; Denyer, 2011; Maene, 2013).

Infants are at particular risk of MARSI as the epidermis and stratum corneum of infant skin are thinner than that of adults, until at least the second year of life (Stamatas et al., 2011). In addition, the cohesiveness of the epidermis to the dermis in neonatal skin is lower than adult skin (Lund and Tucker, 2003), which increases the risk of skin injury (McNichol et al., 2013).

Clinical Question 34: How may Medical Adhesive-Related Skin Injury (MARSI) be avoided in the application and removal of wound dressings?

Evidence Statement

A best practice guideline "The Art of Dressing Selection: A Consensus Statement on Skin Tears and Best Practice" (LeBlanc et al., 2016) and "MARSI made easy" (McNichol and Bianchi, 2016) addressed this question. There are four broad categories for preventing and minimising incidence of MARSI (Holloway and Jones, 2005; McNichol et al., 2013;Davis, 2016). It is important to implement a multifactorial MARSI-prevention regime incorporating; thorough assessment and identification of at-risk patients, appropriate skin preparation, appropriate selection of medical adhesives, and best practice application and removal of adhesives, to reduce incidence of MARSI. Table 3 outlines intrinsic and extrinsic patient risk factors for the development of MARSI.

Table 3: Intrinsic and Extrinsic Patient Factors for the development of MARSI (adapted from McNichol and Bianchi [2016])

Intrinsic Patient Risk Factors	Extrinsic Patient Risk Factors
• Extremes of age (neonate/premature infant and the elderly) • Race/ethnicity • Dermatologic conditions (e.g eczema, dermatitis, chronic exudative ulcers, epidermolysis bullosa) • Co-morbidities (i.e. diabetes, infection, renal insufficiency, immunosuppression, venous insufficiency, venous hypertension, peri-stomal varices) • Malnutrition • Dehydration	• Drying of the skin due to harsh skin cleansers, excessive bathing, low humidity • Prolonged exposure to moisture • Certain medications (e.g. antiinflammatory agents, anticoagulants, chemotherapeutic agents, long-term corticosteroid use) • Radiation therapy • Repeated taping

Refer to appendix VIII for MARSI classification examples and for steps to reduce the incidence of MARSI.

Recommendations

34.1 The clinician should assess for all of the following risk factors for MARSI and document same before choosing an appropriate medical adhesive.
HSE Recommendation Evidence Grade: D

34.2 Staff should adhere to manufacturer's instructions in adhesive product application and removal.
HSE Recommendation Evidence Grade: D

34.3 Clinicians should only remove dressings when there is a clinical indication to do so (e.g. due to exudate levels) as removing dressings too frequently can cause unnecessary trauma to the skin and potentially delay wound healing.
HSE Recommendation Evidence Grade: D

34.4 For infants and children, and particularly those at risk of MARSI, clinicians should consider alternative means of securing dressings, for example, tubular retention bandages.
HSE Recommendation Evidence Grade: D

Good Practice Point

Prevention of skin tears should be considered key to wound management and primary prevention is the best treatment.

1.14 Skin Tears

Skin tears are described as traumatic wounds resulting from separation in the two principle skin layers, the dermis and epidermis. They are caused by shear, friction and/or blunt force. These wounds are common in the older adult and the literature suggests that they are more prevalent than pressure ulcers. Skin tears are prevalent in critically ill patients and neonates. They may be partial or full thickness (LeBlanc and Baranoski, 2011; LeBlanc et al., 2013)

The Payne and Martin Classification System was first defined by Payne and Martin (1993) and adapted by Carville to produce the Skin Tear Audit Research Tool (STAR). In 2011, a Best Practice Statement was produced by the All Wales Tissue Viability Nurse Forum. Due to the recognition of wide variations in practice, 12 key opinion leaders met to devise a universally accepted and validated classification system for the assessment of skin tears.

The International Skin Tear Advisory Panel (ISTAP) Skin Tear tool kit incorporates:

- skin tear risk assessment
- skin tear classification
- skin tear decision algorithm
- skin tear treatment

This can be accessed on the following link: http://www.skintears.org/pdf/Skin-Tear_Resource-Kit.pdf

1.15 Allergic Reactions to Wound Dressings

Clinical Question 35: How should allergic reactions to wound dressings be managed?

Allergic reactions to wound dressings are not uncommon. Dressings that cause allergies should not be used and topical steroids may be needed for treatment. Tapes that are used to hold dressings in place are a common cause of allergic reactions (Jones et al., 2006).

Evidence Statement

Contact dermatitis is either irritant (80% of cases) or allergic (20% of cases). Patients with chronic wounds are frequently exposed to potential allergens in addition to having an impaired barrier function of the skin. Consequently, sensitisation can be high in this patient group (Alavi et al., 2016). Common known allergens to avoid in wound care patients include fragrances, colophony, lanolin, and topical antibiotics.

Refer to appendix IX for a list of common allergens in wound care products.

Recommendations:

35.1 Clinicians must establish the allergy status of the individual as part of the comprehensive assessment.
HSE Recommendation Evidence Grade: D

35.2 Following the introduction of any new product in the wound management process, the clinician must observe for the possibility of hypersensitivity.
HSE Recommendation Evidence Grade: D

35.3 Clinicians should avoid potential wound care product allergens, especially when treating paediatric patients or patients with leg ulcers.
HSE Recommendation Evidence Grade: D

35.4 If contact dermatitis develops the clinician should remove the dressing immediately. Treatment may include corticosteroid creams, oral antihistamines, topical immune response modifiers (e.g. tacrolimus, pimecrolimus), and moisturisers.
HSE Recommendation Evidence Grade: D

35.5 Clinicians should suspect allergic contact dermatitis if there are eczematous changes surrounding the wound where topical medications and dressings were applied, if the wound does not respond to treatment, or if there is recurrent eczema around the wound with minimal improvement from topical corticosteroids.
HSE Recommendation Evidence Grade: C

35.6 For a potential allergy to a component in a wound dressing, the clinician should consider applying the product to normal skin with a 1-2cm size for 48 hours and assessing the response on removal to detect underlying erythema and oedema.
HSE Recommendation Evidence Grade: C

35.7 For leg ulcers, the clinician may apply the dressing samples to normal skin on the other leg or above compression bandaging on the ulcerated extremity and assess the response to the product on removal.
HSE Recommendation Evidence Grade: C

35.8 Where clinically indicated, the clinician should refer the patient for patch testing to diagnose allergic contact dermatitis.
HSE Recommendation Evidence Grade: D

1.16 Adjunctive Advanced Therapies

Negative Pressure Wound Therapy

Clinical Question 36: What is the role of negative pressure wound therapy (NPWT) in the management of wounds?

Evidence Statement

This question was addressed by a meta-analysis (Hyldig et al., 2016), two Cochrane reviews (Webster et al., 2014; Dumville et al., 2015), a textbook 'Wound Care Essentials: Practice Principles (Baranoski and Ayello, 2015) and a systematic review and meta-analysis (Sandy-Hodgetts and Watts, 2015).

A meta-analysis of NPWT in the treatment of closed surgical incisions (Hyldig et al., 2016) found that compared with standard postoperative dressings, NPWT significantly reduced the rate of wound infection and seroma when applied to closed surgical wounds. A further review (Webster et al., 2014) examined the efficacy of NPWT for skin grafts and surgical wounds healing by primary intention. The authors conclude that the evidence for the effects of NPWT on SSI, wound dehiscence, and healing rates remains unclear. However, the rates of graft loss may be lower when NPWT is used. The authors warn that given the high incidence of blisters occurring when NPWT is used following orthopaedic surgery, the therapy should not be widely used until safety in this population is established. A further review (Dumville et al., 2015), reported that there is currently no rigorous RCT evidence available regarding the clinical effectiveness of NPWT in the treatment of surgical wounds healing by secondary intention. The potential benefits and harms of using this treatment for this wound type remain largely uncertain. Conversely, (Sandy-Hodgetts and Watts, 2015) examined the effectiveness of NPWT/closed incision management in the prevention of post-surgical wound complications. The authors report that the meta-analyses showed a difference in SSIs in favour of the use of NPWT as compared to standard surgical dressings. In one study (Schwartz et al., 2015), single-use NPWT was found to be efficacious for the treatment of chronic lower leg wounds, resulting in an increase in granulation tissue, a decrease in wound size and depth, with high patient satisfaction and few complications

Recommendations

36.1 Negative Pressure Wound Therapy (NPWT) is indicated in the management of patients with chronic, acute, traumatic, sub-acute and dehisced wounds.
HSE Recommendation Evidence Grade: C

36.2 The choice of NPWT should be based on clinical indication, cost-effectiveness and local policy/guideline.
HSE Recommendation Evidence Grade: C

36.3 The clinician must be aware of and adhere to the manufacturer's instructions, local policy and guidelines. Prescribing NPWT carries with it an understanding that those prescribing NPWT are fully aware of its contraindications and precautions.
HSE Recommendation Evidence Grade: C

36.4 The clinician should consider the use of single-use NPWT in specific closed surgical incision wounds when the risk of wound dehiscence is expected e.g. diabetes, high BMI, multiple co-morbidities.
HSE Recommendation Evidence Grade: B

36.5 Clinicians who prescribe NPWT must be able to provide robust rationale for its use for the treatment of the wound.
HSE Recommendation Evidence Grade: D

36.6 The clinician must be aware that patients on NPWT require review at regular intervals to ensure that the indications for use are still relevant, the wound is progressing and the NPWT is the most cost-effective choice for the specific wound.
HSE Recommendation Evidence Grade: D

36.7 The clinician should reassess and consider cessation of NWPT if:

- the wound is not progressing after 2 weeks or more
- the condition of the wound deteriorates
- advised by the primary consultant, or
- requested by the patient

HSE Recommendation Evidence Grade: D

Negative Pressure Wound Therapy with Instillation

Clinical Question 37: What is the role of negative pressure wound therapy with instillation (NPWTi) in the management of wounds?

Evidence Statement

A systematic review examining NPWT with Instillation (NPWTi) (Kim et al., 2015) addressed this question. The authors conclude that there is evidence that when NPWTi is used as the standard of care in properly selected cases it provides better overall clinical outcomes than NPWT alone. Normal Saline (0.9%) is the most commonly used solution. Use of this therapy should be combined with good standards of care based on the needs of the patient, for example, use of debridement, offloading, and vascular assessment, among others.

Recommendations

37.1 NPWTi is indicated in the management of chronic, acute, traumatic, sub-acute, infected and dehisced wounds.
HSE Recommendation Evidence Grade: B

37.2 For correct use of NPWTi please refer to manufacturer's instructions in conjunction with clinical instruction.
HSE Recommendation Evidence Grade: D

37.3 Normal saline is the most commonly used solution for NPWTi.
HSE Recommendation Evidence Grade: D

Larval Therapy

Clinical Question 38: What are the indications for larval therapy in the management of wounds?

Evidence Statement

Arabloo et al., (2016) identified from their review, five studies (Wayman et al., 2000; Dumville et al., 2009, Soares et al., 2009; Opletalova et al., 2012; Zarchi and Jemec, 2012) which showed that healing with larval therapy was slightly earlier than the usual methods, and that pain perception in larval therapy was a little more than usual methods. However, the quality of life of those patients who received larval therapy was better and they showed a greater preference to larval therapy as it was relatively safe and had a low rate of side effects. Larval therapy has several advantages such as rapid wound debridement, infection elimination, pain control and ulcer healing. Larval therapy promotes rapid wound debridement, infection elimination, pain control and ulcer healing.

Recommendations

38.1 The choice of debridement method should be based on comprehensive patient and wound assessment, the available expertise, patient preference, clinical context and cost.
HSE Recommendation Evidence Grade: C

38.2 Larval therapy should be considered in the debridement of wounds where the wound bed has wet, necrotic/slough tissue.
HSE Recommendation Evidence Grade: A

38.3 Manufacturer's instructions, local policy and guidelines must be adhered to. Prescribing larval therapy carries with it an understanding that those prescribing larval therapy are fully aware of the contraindications and precautions.
HSE Recommendation Evidence Grade: D

*Please refer to **section 1.15** on wound debridement for full debridement guidance.*

Hyperbaric Oxygen Therapy

Clinical Question 39: What is the recommendation for the use of hyperbaric oxygen therapy (HBOT) in the management of wounds?

Evidence Statement

A Cochrane Review "Hyperbaric oxygen therapy for chronic wounds" (Kranke et al., 2015) addressed this question.

This review included 12 trials (n=577) and the authors concluded that in people with diabetic foot ulcers, HBOT significantly improved the ulcer healing in the short term. More trials are needed to properly evaluate HBOT in people with chronic wounds. These trials must be adequately powered and designed to minimise bias.

Recommendations

39.1 Hyperbaric oxygen therapy should be considered for patients with chronic wounds and used in combination with conventional wound treatments. Application is dependent on availability, suitability and based on comprehensive patient and wound assessment.
HSE Recommendation Evidence Grade: A

Electrical Stimulation

Clinical Question 40: What is the recommendation for the use of electrical stimulation in the management of wounds?

Evidence Statement

A Systematic Review "The efficacy of electrical stimulation (ES) in lower extremity cutaneous wound healing: a systematic review" (Ashrafi et al., 2017) addressed this question. The authors conclude that the majority of studies have shown accelerated wound healing with the use of ES compared to standard therapy and placebo. There are several ES modalities available and used successfully for lower extremity wound healing, although the number of studies range in quantity and quality across the different modalities and differ in their protocol of use. This leads to difficulty in firmly establishing the best ES device available for the management of lower extremity wounds. Further studies are necessary to establish the ideal ES modality, parameters, method of delivery and duration of treatment

Recommendation

40.1 Electrical stimulation should be considered as an adjunct to standard wound care in wounds that are failing to progress as expected.

HSE Recommendation Evidence Grade: B

1.17 Debridement

Debridement is an integral part of wound management and is widely used for WBP (Madhok et al., 2013). Debridement refers to the process of removing devitalised tissue, infected tissue, hyperkeratosis, slough, pus, debris or any other type of bio-burden from a wound to promote healing of underlying viable tissue (Madhok et al., 2013; Strohal et al., 2013). Debridement is described as a continuous process in the wound management cycle, which may be used as an adjunct to other treatment methods (Kamolz and Wild, 2013). Debridement helps to reduce bacterial burden within a wound, regulates inflammation and odour, creates a healthy wound bed, wound margins and peri-wound skin and ultimately promotes growth of granulation tissue. Debridement can address all four principles of TIME, an acronym used to accurately assess the wound, identify the presence of devitalised tissue and plan appropriate interventions (Moore, 2012). The four principles TIME addresses:

- tissue -removal of non-viable tissue
- infection- treatment of infection
- moisture- correction of moisture imbalance
- edge of wound- management of non-advancing wound margins or wound edges that experience undermining (EWMA, 2004)

The following are methods of debridement:

- autolytic
- enzymatic
- larval therapy
- mechanical
- conservative sharp debridement/ sharp debridement
- surgical debridement
- hydro-surgery
- ultrasound

Clinical Question 41: What are the indications for wound debridement?

Evidence Statement

A guidance document on debridement by EWMA (Strohal et al., 2013) addressed this question.

Recommendations

41.1 Debridement should be considered as an adjunct in the treatment of wounds for the purpose of wound bed preparation.

HSE Recommendation Evidence Grade: D

Good Practice Point

When choosing a method of wound debridement the clinician should exercise clinical judgment and consider the following factors:

- type and anatomical location of the wound
- available resources and cost of debridement
- skill and knowledge of the clinician
- patient preference

Clinical Question 42: What are the indications for the use of autolysis as a method of debridement?

Evidence Statement

Autolytic debridement refers to the process whereby the wound bed clears itself of debris when the body's proteolytic enzymes degrade non-viable tissue. Optimising a moist environment through use of occlusive and semi-occlusive dressings can both promote and enhance this process (Smith et al., 2013). It is the easiest and most natural form of debridement which can be facilitated by clinicians without specialist skills. However this process can be slow. Products for autolytic debridement are easy to use and result in little pain. Autolytic debridement is selective which implies that healthy tissue is not damaged (Strohal et al., 2013).

Recommendation

42.1 Autolytic methods of debridement can be considered in the treatment of both acute and chronic wounds.

HSE Recommendation Evidence Grade: D

Clinical Question 43: What are the indications for the use of enzymatics as a method of debridement?

Evidence Statement

Enzymatic debridement is relatively safe and effective. It involves the application of either papain or collagenase based products, available as topical ointments that degrade necotic tissue. Collagenase based debridement specifically digests and degrades all helical collagen, whereas papain is a non-specific proteolytic enzyme which requires specific activators in order to work and does not digest collagen. Papain produces an inflammatory response which is associated with pain, unlike collagenase based products (Enoch and Leaper, 2008). Both products require prescription and should be applied only to non-viable tissue, not to surrounding skin or tissue. Whilst this option is often effective, it is slow and infection may pose as a threat to the wound (Strohal et al., 2013).

Recommendations

43.1 Enzymatic debridement should be considered in patients with wounds where mechanical debridement options are not available or are contra-indicated; for example, in patients with bleeding problems.

HSE Recommendation Evidence Grade: D

Clinical Question 44: When is larval therapy indicated as a method of debridement?

Evidence Statement

Larval/maggot therapy is a form of biological debridement. The larvae of Lucilia sericata (green bottle fly) are applied to the wound. The larvae produce powerful proteolytic enzymes that eliminate necrotic tissue by liquefying and ingesting it, kill and consume bacteria, and stimulate wound healing by promoting fibroblast growth (Broadus, 2013). The method is rapid and selective. Healthy tissue is not damaged (Smith et al., 2013). Larval therapy is available as" bagged" or "loose" therapy. Larval therapy is not suitable for all patients and the condition of the wound must be appropriate to ensure survival of the maggots. Specialist training is a prerequisite for clinicians in order to apply appropriately and treatment needs to be ordered in advance. Costs associated with treatment are higher than autolytic and enzymatic debridement, but treatment times are shorter (Kamolz and Wild, 2013). Larval therapy has several advantages such as rapid wound debridement, infection elimination, pain control and ulcer healing**.**

Recommendations

44.1 Larval therapy should be considered as a method of wound debridement where;

- autolysis is not appropriate
- surgical/sharp debridement not suitable
- a well hydrated burden of dehydrated tissue needs removal

HSE Recommendation Evidence Grade: D

Clinical question 45: When is mechanical debridement indicated as a method of debridement?

Evidence Statement

Mechanical debridement refers to the physical removal of necrotic debris from the wound. Mechanical debridement may be achieved through use of wet to dry gauze dressings or monofilament fibre pads (McFarland and Smith, 2014).

Monofilament Fibre Pad

The monofilament debridement pad has been recently introduced as a modern wound debriding product, designed to mechanically remove slough and devitalised cells from the wound bed. The wound contact side is fleece like and once wetted is gently rubbed over the surface of the wound. When the slough is tenacious or hard necrosis, it is recommended that the tissue is softened prior to using the pad (Benbow, 2011).

Recommendations

45.1 The use of the monofilament pad should be considered in the debridement of wounds.

HSE Recommendation Evidence Grade: D

Clinical Question 46: When is conservative sharp debridement indicated in wound debridement?

Evidence Statement:
Conservative sharp debridement refers to a minor surgical procedure involving the removal of devitalised tissue, callous or hyperkeratosis tissue with a scalpel or scissors, and forceps. This is relatively pain free and is considered an important component of chronic wound care (Kamolz and Wild, 2013;Rodd-Nielsen and Harris, 2013). It is often used in combination with autolytic debridement methods as not all non-viable tissue may be removed with sharp debridement.

Recommendations
46.1 Conservative sharp debridement should be considered in the treatment of chronic wounds, particularly in cases of slower than expected wound healing.
HSE Recommendation Evidence Grade: B

46.2 The clinician should assess for the presence of any of the following contraindications to sharp debridement:

- disturbance of blood coagulation or taking anticoagulation medication
- presence of peripheral arterial disease requiring vascular assessment/intervention or ischaemic diabetic foot ulcer with dry gangrene
- presence of adherent tissue that prevents clear distinction between viable and non-viable tissue
- an increased risk of bleeding or exposure of blood vessels, such as malignant wounds

HSE Recommendation Evidence Grade: D

Clinical Question 47: When is the use of surgical debridement of wounds indicated?

Evidence Statement

Surgical debridement may be defined as excision of devitalised tissue using surgical techniques (Sibbald et al., 2000). Surgical debridement is performed in the operating theatre, often by a surgeon, and provides instant removal of non-viable tissue. Disadvantages of surgical debridement include: hospital admission, anaesthesia, potential complications and costs of theatre time. Surgical debridement can result in excision of healthy tissue, excessive bleeding and pain and is not suitable for all patients (Sibbald et al., 2000; Baharestani, 2007). This method of debridement requires informed patient written consent and additional clinician training and skill (Ashworth and Chivers, 2002).

Recommendation

47.1 This frequently used and effective method of debridement should only be conducted by the appropriately educated and skilled clinician.

HSE Recommendation Evidence Grade: D

Clinical Question 48: When is the use of hydrosurgery indicated as a method of wound debridement?

Evidence Statement

Hydrosurgery involves the use of pressurised water or saline and a cutting instrument though a disposable handset. It provides a quick selective method of debridement, but requires skill and can be painful for the patient. It can be performed outside a theatre setting but carries a risk of cross-contamination, therefore protective eyewear and clothing must be worn. It is costly but cheaper than surgical debridement.

Recommendation

48.1. Hydrosurgery is safe and may be considered as an adjunct in the treatment of wounds.

HSE Recommendation Evidence Grade: B

Clinical Question 49: What are the indications for the use of ultrasound as a method of wound debridement?

Evidence Statement

Ultrasound therapy for wound debridement involves pulsed or continuous doses at either high or low frequencies and may involve direct contact with the wound bed or non-contact through use of normal saline solution (McFarland and Smith, 2014). It initiates physiological wound healing mechanisms and has antimicrobial effects. High frequency ultrasound raises the temperature of the wound tissue, which is understood to stimulate blood flow (Madhok et al., 2013). Low frequency ultrasound involves creating micro bubbles at the wound surface (cavitation), which loosen slough, biofilm and bacteria on the wound bed; thereafter acoustic streaming occurs whereby the cells are stimulated to promote natural healing. Limited evidence suggests that non-contact, low hertz frequency ultrasonic mist therapy promotes wound healing when used in conjunction with standard wound therapy. In patients presenting with either venous stasis or diabetic foot ulcers, early healing appears to be facilitated by low frequency, low intensity non-contact ultrasound or low frequency high intensity contact ultrasound (Voigt et al., 2011). Butcher and Pinnuck (2013) conclude that there is sufficient evidence to support the use of low frequency ultrasound in the treatment of chronic wounds. Existing evidence indicates that the combined clinical effects of rapid debridement, wound healing stimulation and antibacterial activity help manage the complex issue of biofilms, promote faster healing and reduce the impact of chronic wounds on patient quality of life.

Recommendations

49.1 Ultrasound debridement is safe and may be used as an adjunct in the treatment of acute wounds.

HSE Recommendation Evidence Grade: A

49.2 Ultrasound debridement is safe and may be used as an adjunct in the treatment of chronic wounds.

HSE Recommendation Evidence Grade: A

2. Diabetic Foot Ulceration

Diabetic foot ulcers (DFUs) can be defined as a localised tissue injury to the skin and/or underlying tissue, below the ankle, in a person with diabetes. They are an increasingly common complication of diabetes, and these chronic wounds adversely affect patient's morbidity, mortality and quality of life. Patients with DFUs are at increased risk of limb amputation. DFU aetiology is complicated by the other common sequelae of diabetes such as peripheral neuropathy, compromised immunity and vascular dysfunction, making the management of these wounds complex (Volmer-Thole and Lobmann, 2016).

The lifetime risk of developing a DFU in those with diabetes ranges from 15% (Leone et al., 2012) to 25% (Yazdanpanah et al., 2015). While true prevalence is difficult to ascertain, it is estimated that it ranges from 4%-27% (Flanagan, 2005; Nather et al., 2008; Richard and Schuldiner, 2008; Posluszny et al., 2012; Flanagan, 2013; Al Ayed et al., 2015). DFUs account for 20% of all diabetes-related hospital admissions (Snyder and Hanft, 2009) and DFUs are attributable to 85% of amputations carried out on patients with diabetes. It is estimated that between 5–15% of those with a DFU will require an amputation (Boike and Hall, 2002).

According to HSE records (Healthcare Pricing Office [HPO], 2016), 443 patients with diabetes had lower limbs amputated in 2014 which is an increase from 393 in 2013. In 2014 there were almost 1,700 cases of patients with diabetes requiring admission to hospital for the treatment of DFUs. In 2015, 2400 patients were hospitalised with diabetic foot related issues and there were 451 amputations; that is eight people per week with diabetes having lower limb amputations. An Irish study (Nolan et al., 2006) showed the average cost for the inpatient treatment for a foot ulcer was €30,000 per patient. Therefore treating 451 patients in 2015 cost €13.5 million.

The International Diabetes Federation (IDF) estimated that the national prevalence of diabetes in Ireland is 5.3% in 2015 (IDF, 2015) in the 20-79 age group. In 2015, the IDF estimated there were 64,800 undiagnosed cases (45.6% of adults living with diabetes) in Ireland. Data from 'The Irish Longitudinal Study on Ageing' (Whelan and Savva, 2013) found the prevalence of type 2 diabetes to be 11.9% in the over 75 age group. The number of children with diabetes is increasing significantly, meaning prevention and education regarding this condition must be aimed at a younger population than before. In 2015 Ireland was ranked 7th highest in global incidence of newly diagnosed type 1 diabetes cases in those under the age of 15, with 26.8 new cases per 100,000 population, per year.

While information on specific wound types cannot be extrapolated from the HIPE system, diabetes accounted for 108,601 of all listed total discharges in 2014 which represents a 196.34% increase from 2002 figures (36,642) (HPO, 2016). These findings are in line with findings by Tracey et al. (2016); between 1998 and 2015 there was a

significant increase in cases of doctor diagnosed diabetes in Ireland with the national prevalence increasing from 2.2% (1998) to 5.3% (2015) in adults.

In this guidance document, all recommendations are based upon international evidence derived from The International Working Group on the Diabetic Foot (IWGDF) Guidance Documents on Prevention and Management of Foot Problems in Diabetes (2015), a 2016 NICE guidance document "Diabetic foot problems: prevention and management (NG19) and/ or the HSE Model of Care for the Diabetic Foot (HSE, 2011).

Certain recommendations in this section of the guideline draw on NICE guidance:

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2.1 Prevention of Diabetic Foot Disease

Clinical Question 50: Should a person with diabetes be screened for foot ulcer risk?

Evidence Statement

Foot problems associated with diabetes mellitus are amongst the most serious and costly complications of diabetes. Foot problems are a major source of morbidity and mortality and place a significant burden on healthcare and society. Prevention is the cornerstone to the management of diabetic foot disease; close monitoring of people's feet can reduce foot problems and their sequealae (IWGDF, 2015).

Recommendation

50.1 For adults with diabetes, assess their risk of developing a diabetic foot problem at the following times:

- when diabetes is diagnosed, and at least annually thereafter
- if any foot problems arise
- on any admission to hospital and if there is any change in their status while they are in hospital

HSE Recommendation Evidence Grade: C

Clinical Question 51: What should an at-risk person with diabetes be screened for?

Evidence Statement

Key risk factors for diabetic foot disease include the presence of peripheral neuropathy, foot deformities, peripheral arterial disease, history of current or previous ulceration and/ or lower extremity amputation (IWGDF, 2015; NICE, 2016). For the current guideline, we define the at-risk patient in line with the definition from the International Working Group on the Diabetic Foot (2015) as "*a patient with diabetes who does not have an active foot ulcer, but who has peripheral neuropathy, with or without the presence of foot deformity or peripheral artery disease, or a history of foot ulcer(s) or amputation of (a part of) the foot or leg*".

Recommendations

51.1 To identify a person with diabetes at risk for foot ulceration, examine the feet annually to seek evidence for signs or symptoms of peripheral neuropathy and peripheral arterial disease. When examining the feet of a person with diabetes, remove their shoes, socks, bandages and dressings, and examine both feet for evidence of the following risk factors:

- neuropathy (use a 10 g monofilament as part of a foot sensory examination).
- limb ischaemia
- ulceration
- callus
- infection and/or inflammation
- deformity
- gangrene
- charcot neuroarthropathy

HSE Recommendation Evidence Grade: C

51.2 If a person with diabetes has peripheral neuropathy, screen for: a history of foot ulceration or lower-extremity amputation; peripheral artery disease; foot deformity; pre ulcerative signs on the foot; poor foot hygiene; and ill-fitting or inadequate footwear.
HSE Recommendation Evidence Grade: C

51.3 Assess the person's current risk of developing a diabetic foot problem or needing an amputation using the following risk stratification:

Low risk:

- no risk factors present except callus alone

Moderate risk:

- deformity
- neuropathy
- non-critical limb ischaemia
- visual impairment or*
- physical disability*

High risk:

- previous ulceration
- previous amputation
- end stage renal disease and/ or on renal replacement therapy
- neuropathy and non-critical limb ischaemia together
- neuropathy in combination with callus and/or deformity
- non-critical limb ischaemia in combination with callus and/or deformity
- and/ or previous Charcot neuroarthopathy*

**Recommended in by the HSE Model of Care for the Diabetic Foot (2011)*

Active diabetic foot problem:

- ulceration
- spreading infection
- critical limb ischaemia
- gangrene
- suspicion of an acute Charcot neuroarthropathy, or
- an unexplained hot, red swollen foot with or without pain

HSE Recommendation Evidence Grade: C

Clinical Question 52: How should patients at risk of developing a diabetic foot ulcer be managed?

Evidence Statement
The at-risk patient requires more frequent foot screenings than those deemed to be of low risk. Frequent screenings aim to identify earlier factors that increase the possibility of foot ulcer development, and allow for earlier preventative care. These interventions may prevent foot ulcers, infection, or hospitalisation (IWGDF, 2015).

Recommendations
52.1 Patients at low risk of diabetic foot disease will be managed preventatively through annual screening and regular foot inspections/examinations by primary care clinicians who will emphasise the importance of foot care, and advise them that they could progress to moderate or high risk.
HSE Recommendation Evidence Grade: C

52.2 Moderate risk patients will be referred to the podiatrist, either in the community or in the hospital, for an annual review. These patients will remain under the clinical governance of the General Practitioner (GP) and podiatrist.
HSE Recommendation Evidence Grade: C

52.3 The foot protection service should assess newly referred patients as follows:

- within 2–4 weeks for patients who are at high risk of developing a diabetic foot problem
- within 6–8 weeks for patients who are at moderate risk of developing a diabetic foot problem

HSE Recommendation Evidence Grade: C

52.4 For patients at moderate or high risk of developing a diabetic foot problem, the foot protection service should:

- assess the feet
- where appropriate, provide advice about, and provide, skin and nail care of the feet
- assess the biomechanical status of the feet, including the need to provide specialist footwear and orthoses
- assess the vascular status of the lower limbs
- liaise with other clinicians, for example, the person's GP, dietitian, or diabetes nurse specialist about the person's diabetes management and risk of cardiovascular disease

HSE Recommendation Evidence Grade: C

52.5 Depending on the person's risk of developing a diabetic foot problem, carry out reassessments at the following intervals:

- annually for patients who are at low risk
- frequently (for example, every 3–6 months) for patients who are at moderate risk
- more frequently (for example, every 1–2 months) for patients who are at high risk if there is no immediate concern
- very frequently (for example, every 1–2 weeks) for patients who are at high risk if there is immediate concern
- consider more frequent reassessments for patients who are at moderate or high risk and for patients who are unable to check their own feet

HSE Recommendation Evidence Grade: C

52.6 Patients in hospital who are at moderate or high risk of developing a diabetic foot problem should be given a pressure redistribution device to offload heel pressure. On discharge they should be referred or notified to the foot protection service.
HSE Recommendation Evidence Grade: C

Clinical Question 53: What information should be given to patients in order to educate them about the risk of developing a diabetic foot problem?

Evidence Statement

The evidence surrounding the role of educational measures for those at risk of diabetic foot problems was limited and inconclusive (NICE, 2016). Two non-controlled studies demonstrated that patients who are adherent to advice and education are at much lower risk of developing a first foot ulcer than those who are not adherent. Controlled studies have not been performed though it is believed that patients who are at risk for ulceration should receive some form of education. The information given should include, foot complications and their consequences, preventative behaviour, such as wearing adequate footwear and self- management of foot care, and seeking professional help in a timely manner when they identify a foot problem (IWGDF, 2015).

Recommendation

53.1 Provide information and clear explanations to patients with diabetes and/or their family members/carer's (as appropriate) when diabetes is diagnosed, during assessments, and if problems arise. Information should be oral and written, and include the following:

- basic foot care advice and the importance of foot care
- footwear advice
- foot emergencies and who to contact
- the patient's current risk status of developing a foot problem
- information about diabetes and the importance of blood glucose control

HSE Recommendation Evidence Grade: C

Clinical Question 54: What prevention techniques are effective in preventing a foot ulcer in an at-risk patient with diabetes?

Evidence Statement

Various interventions for the prevention of foot ulcers are employed in clinical practice; self-management, patient education, therapeutic footwear, foot surgery or the combination of two or more of these interventions (IWGDF, 2015).

Recommendations

54.1 For children with diabetes who are under 12 years, give them and their family members or carer's (as appropriate) basic foot care advice.
HSE Recommendation Evidence Grade: C

54.2 For young patients with diabetes (12-17 years), the paediatric care team or the transitional care team should assess the young persons' feet as part of their annual assessment and provide information about foot care. If a diabetic foot problem is present or suspected, the paediatric care team or the transitional care team should refer the young person to an appropriate specialist.
HSE Recommendation Evidence Grade: C

54.3 Treat any pre-ulcerative sign on the foot of a patient with diabetes. This includes: removing callus; protecting blisters and draining if appropriate and necessary; treating ingrown or thickened toe nails; treating haemorrhage when necessary; and prescribing antifungal treatment for fungal infections.
HSE Recommendation Evidence Grade: C

54.4 To protect their feet, the patient with diabetes who is at risk should be instructed not to walk barefoot, in socks, or in thin-soled standard slippers, whether at home or when outside.
HSE Recommendation Evidence Grade: C

54.5 Instruct an at-risk patient with diabetes to: daily inspect their feet and the inside of their shoes; daily wash their feet (with careful drying particularly between the toes); avoid using chemical agents or plasters to remove callus or corns; use emollients to lubricate dry skin; and cut toe nails straight across.
HSE Recommendation Evidence Grade: C

54.6 Instruct an at-risk patient with diabetes to wear properly fitting footwear to prevent a first foot ulcer, either plantar or non-plantar, or a recurrent non-plantar foot ulcer. When a foot deformity or a pre-ulcerative sign is present, consider prescribing therapeutic shoes, custom-made insoles, or toe orthosis.
HSE Recommendation Evidence Grade: C

54.7 Instruct an at-risk patient with diabetes to monitor foot skin temperature at home to prevent a first or recurrent plantar foot ulcer. This aims at identifying the early signs of inflammation, followed by action taken by the patient and care provider to resolve the cause of inflammation.
HSE Recommendation Evidence Grade: C

54.8 To prevent a first foot ulcer in an at-risk patient with diabetes, provide education aimed at improving foot care knowledge and behaviour, as well as encouraging the patient to adhere to this foot care advice.
HSE Recommendation Evidence Grade: C

54.9 To prevent a recurrent plantar foot ulcer in an at-risk patient with diabetes, prescribe therapeutic footwear that has a demonstrated plantar pressure relieving effect during walking (i.e. 30% relief compared to plantar pressure in standard of care therapeutic footwear), and encourage the patient to wear this footwear.
HSE Recommendation Evidence Grade: C

54.10 To prevent a recurrent foot ulcer in an at-risk patient with diabetes, provide integrated foot care, which includes professional foot treatment, adequate footwear and education. This should be repeated or reevaluated once every one to three months as necessary.
HSE Recommendation Evidence Grade: C

Clinical Question 55: Is therapeutic footwear effective to prevent first, or recurrent foot ulcers in patients with diabetes?

Evidence Statement

The evidence surrounding the role of different kinds of footwear, insoles and orthoses for those at risk of diabetic foot problems is limited (NICE, 2016). There is some evidence that demonstrates that therapeutic footwear can significantly reduce the risk of a recurrent plantar foot ulcer. Trials have infrequently reported harm related to footwear, so it is considered that the benefits of continuously wearing footwear with a proven offloading effect outweigh the potential harm. The costs of therapeutic footwear may be quite high, but the cost should consider the benefit of ulcer prevention. Evidence suggests that footwear designed or evaluated using plantar pressure measurement is likely to be cost-effective when it can reduce ulcer risk (IWGDF, 2015).

Recommendations

55.1 Instruct an at-risk patient with diabetes to wear properly fitting footwear to prevent a first foot ulcer, either plantar or non-plantar, or a recurrent non-plantar ulcer. When a foot deformity or a pre-ulcerative sign is present, consider prescribing therapeutic shoes, custom-made insoles, or toe orthosis.
HSE Recommendation Evidence Grade: C

55.2 To prevent a recurrent plantar foot ulcer in an at-risk patient with diabetes, prescribe therapeutic footwear that has a demonstrated plantar pressure relieving effect during walking (i.e. 30% relief compared to plantar pressure in standard of care therapeutic footwear), and encourage the patient to wear this footwear.
HSE Recommendation Evidence Grade: C

55.3 Consider using shoe modifications, temporary footwear, toe spacers, or orthoses to offload and heal a non-plantar foot ulcer without ischaemia or uncontrolled infection in a patient with diabetes. The specific modality will depend on the type and location of the foot ulcer.
HSE Recommendation Evidence Grade: C

55.4 Consider referral for orthopaedic opinion/surgical intervention to assist in the prevention of primary ulceration or ulcer recurrence in a high risk patient with diabetes who has biomechanical anomalies and/ or structural deformities and where conservative treatment fails.
HSE Recommendation Evidence Grade: C

2.2 Service Provision for and Referral of Persons with Diabetic Foot Problems

Clinical Question 56: What are the appropriate avenues of referral for patients with active diabetic foot problems?

Evidence Statement
Each hospital should have a care pathway for people with diabetic foot problems who need inpatient care. A named consultant should be accountable for the overall care of the person, and for ensuring that clinicians provide timely care. Refer the person to the multidisciplinary foot care service within 24 hours of the initial examination of the person's feet. Transfer the responsibility of care to a consultant member of the multidisciplinary foot care service if a diabetic foot problem is the dominant clinical factor for inpatient care (NICE, 2016).

Refer to appendix X for the

- *Integrated Model of Management/Care Pathway of People with Diabetic Foot Problems*
- *Care pathway for people with Diabetic Foot Problems (adapted from NICE guidelines for Diabetic Foot Care 2004; 2016).*

Recommendations
56.1 If a person has a limb-threatening or life-threatening diabetic foot problem, refer them immediately to acute services and inform the multidisciplinary foot care service according to local and national protocols and pathways, so they can be assessed and an individualised patient treatment plan initiated.

Examples of limb-threatening and life-threatening diabetic foot problems include the following:

- ulceration with fever or any signs of sepsis
- ulceration with limb ischaemia (see the NICE guideline on lower limb peripheral arterial disease)
- clinical concern that there is a deep-seated soft tissue or bone infection (with or without ulceration)
- gangrene (with or without ulceration)

HSE Recommendation Evidence Grade: C

56.2 For all other active diabetic foot problems, refer the person within 1 working day to the multidisciplinary foot care service or foot protection service according to local/national protocols and pathways, for triage within 1 further working day.
HSE Recommendation Evidence Grade: C

Clinical Question 57: What factors should be considered by service providers in the care of patients with diabetic foot ulcers?

Evidence Statement

Prevention of diabetic foot ulceration is essential in order to eradicate and reduce the high morbidity and mortality rates associated with this health problem (Alexiadou and Doupis, 2012). Clinicians practicing in the management of diabetic foot ulceration must be adept at being able to identify the foot at risk of ulceration by means of careful inspection and physical examination of the foot followed by the implementation of gold standard treatments (Alexiadou and Doupis, 2012). Frequent and prompt foot examination alongside patient education, quality hygienic practices, provision of appropriate footwear, and prompt treatment of minor injuries can decrease ulcer occurrence by 50% and eliminate the need for major amputation in non-ischaemic limbs (Lavery et al., 2005;Larsson et al., 1995).

Recommendations

57.1 When providing care for patients with DFU, commissioners and service providers should ensure that the following are in place:

- A foot protection service for preventing diabetic foot problems, and for treating and managing diabetic foot problems in the community
- A multidisciplinary foot care service for managing diabetic foot problems in hospital and in the community that cannot be managed by the foot protection service (this may also be known as an interdisciplinary foot care service)
- Robust protocols and clear local pathways for the continued and integrated care of patients across all settings, including emergency care and general practice. The protocols should set out the relationship between the foot protection service and the multidisciplinary foot care service
- Regular reviews of treatment and patient outcomes, in line with best clinical audit practices

HSE Recommendation Evidence Grade: C

57.2 The foot protection service should be led by a podiatrist with specialist training in diabetic foot problems, and should have access to clinicians with skills in the following areas:

- diabetology
- biomechanics and orthoses
- wound care

HSE Recommendation Evidence Grade: C

57.3 The multidisciplinary foot care service should be led by a named clinician, and consist of specialists with skills in the following areas:

- diabetology
- podiatry
- diabetes specialist nursing

- vascular surgery
- microbiology
- orthopaedic surgery
- biomechanics and orthoses
- interventional radiology
- casting
- wound care

HSE Recommendation Evidence Grade: C

57.4 The multidisciplinary foot care service should have access to rehabilitation services to include physiotherapy and occupational therapy, plastic surgery, psychological services, social work and dietetic services.
HSE Recommendation Evidence Grade: C

57.5 Clinicians may need to discuss, agree and make special arrangements for disabled patients and patients who are housebound or living in care settings, to ensure equality of access to foot care assessments and treatments for patients with diabetes.
HSE Recommendation Evidence Grade: C

57.6 Take into account any disabilities including visual impairment, when planning and delivering care for patients with diabetes.
HSE Recommendation Evidence Grade: C

Clinical Question 58: What are the key components and organisations of hospital care to ensure optimal management of patients with diabetic foot problems?

Evidence Statement

Diabetes increases the incidence of foot ulcer admissions leading to a substantial increase in hospitals' costs, the majority of which are related to the treatment of infected foot ulcers (Hicks et al., 2016). Health services need to develop and implement education initiatives and primary prevention strategies through outpatient multidisciplinary care targeted at high-risk populations (Hicks et al., 2016). At hospital level a named consultant should be accountable for the overall care of the patient and for ensuring that clinicians provide timely care (NICE, 2016).

Recommendations

58.1 Each hospital should have a care pathway for patients with diabetic foot problems who need inpatient care.
HSE Recommendation Evidence Grade: C

58.2 A named consultant should be accountable for the overall care of the person, and for ensuring that clinicians provide timely care.
HSE Recommendation Evidence Grade: C

58.3 Refer the patient to the multidisciplinary foot care service within 1 working day of the initial examination of the patient's feet. Transfer the responsibility of care to a consultant member of the multidisciplinary foot care service if a diabetic foot problem is the dominant clinical factor for inpatient care.
HSE Recommendation Evidence Grade: C

58.4 The named consultant and the clinicians from the existing team should remain accountable for the care of the person unless their care is transferred to the multidisciplinary foot care service.
HSE Recommendation Evidence Grade: C

Clinical Question 59: What information should be provided to patients with DFU problems?

Evidence Statement

Patient education is a well-established intervention for improving health outcomes across many areas of healthcare. In addition it has been shown that educating patients at risk for diabetic foot ulceration can improve outcomes (Singh et al., 2005). Evidence based patient education in diabetic foot care should lead to patients and their family and/or primary care givers understanding the basis and implications of the loss of protective sensation and the vital importance of daily foot examinations and the proper foot care (Mayfield et al., 2003).

Recommendation

59.1 Provide information and clear explanations as part of the individualised patient treatment plan for patients with a diabetic foot problem. Information should be oral and written, and include the following:

- a clear explanation of the person's foot problem
- pictures of diabetic foot problems
- care of the other foot and leg
- foot emergencies and who to contact
- footwear advice
- wound care
- information about diabetes and the importance of blood glucose control

HSE Recommendation Evidence Grade: C

2.3 Treatment of Active Foot Disease

2.3.1 Diabetic Foot Ulceration Treatment

Clinical Question 60: How should patients with a diabetic foot ulcer be managed?

Evidence Statement

Patients with a diabetic foot ulcer (DFU) need to be assessed holistically to identify intrinsic and extrinsic factors. This should encompass a full patient history including medication, comorbidities and diabetes status. It should also take into consideration the history of the wound, previous DFUs or amputations and any symptoms suggestive of neuropathy or peripheral arterial disease (PAD) (Wounds International, 2013). Without early and optimal intervention, the wound can rapidly deteriorate, leading to amputation of the affected limb. It has been estimated that every 20 seconds a lower limb is amputated due to complications of diabetes. Patients with a DFU should be assessed by the team within one working day of presentation or sooner in the presence of severe infection (Wounds International, 2013).

Recommendations

60.1 If a person has a diabetic foot ulcer, assess and document the size, depth and position of the ulcer.

HSE Recommendation Evidence Grade: C

60.2 Use a standardised system to document the severity of the foot ulcer, such as the SINBAD (Site, Ischaemia, Neuropathy, Bacterial Infection, Area and Depth) or the University of Texas classification system.

HSE Recommendation Evidence Grade: C

60.3 Offer 1 or more of the following as standard care for treating diabetic foot ulcers:

- offloading
- control of foot infection
- control of ischaemia
- wound debridement
- wound dressings

HSE Recommendation Evidence Grade: C

60.4 When choosing wound dressings and offloading, take into account the clinical assessment of the wound and the person's preference.

HSE Recommendation Evidence Grade: C

60.5 When deciding the frequency of reassessment as part of the treatment plan, take into account the overall health of the person with diabetes, how healing has progressed, and any deterioration.
HSE Recommendation Evidence Grade: C

60.6 Ensure that the frequency of monitoring set out in the patients individualised treatment plan is maintained whether the person with diabetes is being treated in hospital or in the community.
HSE Recommendation Evidence Grade: C

Clinical Question 61: What is the best method of debriding a diabetic foot ulcer?

Evidence Statement

No one debridement method has been shown to be more effective in achieving complete ulcer healing. However, in practice, the gold standard technique for tissue management in DFUs is regular, local, sharp debridement using a scalpel, scissors and/or forceps (NICE, 2016; Wu et al., 2015)

The benefits of debridement include:

- removes necrotic/sloughy tissue and callus
- reduces pressure
- allows full inspection of the underlying tissues
- helps drainage of secretions or pus
- helps optimise the effectiveness of topical preparations
- stimulates healing

Recommendations

61.1 When treating diabetic foot ulcers, debridement should only be performed by clinicians with the relevant training and skills using the technique that best matches their specialist expertise and clinical experience, the site of the diabetic foot ulcer and the person's preference.

HSE Recommendation Evidence Grade: D

61.2 Clean ulcers regularly with clean water or saline, debride them when possible in order to remove debris from the wound surface and dress them with a sterile, inert dressing in order to control excessive exudate and maintain a warm, moist environment in order to promote healing.

HSE Recommendation Evidence Grade: C

61.3 In general remove slough, necrotic tissue and surrounding callus with sharp debridement in preference to other methods, taking relative contra-indications such as severe ischaemia into account.

HSE Recommendation Evidence Grade: C

Clinical Question 62: What interventions enhance the healing of chronic ulcers of the foot in diabetes?

Evidence Statement

A Cochrane Review (Wu et al., 2015) "Dressings for treating foot ulcers in people with diabetes: an overview of systematic reviews" addressed this question. In total this review found 13 eligible systematic reviews relevant pertaining to this topic, which contained a total of 17 relevant RCTs. The authors concluded that there is currently no robust evidence for differences between wound dressings for any outcome in foot ulcers in people with diabetes (treated in any setting) and that practitioners may want to consider the unit cost of dressings, their management properties and patient preference when choosing dressings.

Recommendation

62.1 Clinicians may want to consider the unit cost of dressings, their management properties and patient preference when choosing dressings as there is currently no evidence to support the use of one dressing product over another in the treatment of the diabetic foot ulceration.
HSE Recommendation Evidence Grade: A

62.2 Select dressings principally on the basis of exudate control, comfort and cost.
HSE Recommendation Evidence Grade: C

62.3 Do not use antimicrobial dressings with the goal of improving wound healing or preventing secondary infection.
HSE Recommendation Evidence Grade: C

62.4 Consider the use of systemic hyperbaric oxygen therapy, even though further blinded and randomised trials are required to confirm its cost-effectiveness and to identify the population most likely to benefit from its use.
HSE Recommendation Evidence Grade: C

62.5 Negative pressure wound therapy may be considered in post-operative wounds/ or after surgical debridement and on the advice of the multidisciplinary foot care service, even though the effectiveness and cost-effectiveness of the approach remains to be established.
HSE Recommendation Evidence Grade: C

62.6 Do not select agents reported to improve wound healing by altering the biology of the wound, including growth factors, bioengineered skin products and gases, in preference to accepted standards of good quality care.
HSE Recommendation Evidence Grade: C

62.7 Consider dermal or skin substitutes as an adjunct to standard care when treating diabetic foot ulcers, only when healing has not progressed and on the advice of the multidisciplinary foot care service.
HSE Recommendation Evidence Grade: C

62.8 Do not select agents reported to have an impact on wound healing through alteration of the physical environment, including through the use of electricity, magnetism, ultrasound and shockwaves, in preference to accepted standards of good quality care.
HSE Recommendation Evidence Grade: C

62.9 Do not select systemic treatments reported to improve wound healing, including drugs and herbal therapies, in preference to accepted standards of good quality care.
HSE Recommendation Evidence Grade: C

2.3.2 Diabetic Foot Infection

Clinical Question 63: How should foot infection be assessed and diagnosed in patients with diabetes?

Evidence Statement

Chronic hyperglycaemia associated with diabetes mellitus is known to have a detrimental effect on human immune function; specifically, cellular immunity and polymorphonuclear leukocytes are affected and phagocytosis is impaired (Akkus et al., 2016). Thus, people with diabetes are at increased risk of diabetic foot infections (DFIs). According to Peters (2016) the incidence of foot infections in people with diabetes ranges from an overall life-time risk of 4% to a yearly risk of 7%. Diabetic foot infection usually occurs when pathogens enter the foot through a break in the skin's integrity, for instance via a neuropathic or neuro-ischaemic foot ulceration (Peters, 2016). Diabetic foot infection is associated with significant morbidity and mortality; infection can spread rapidly in the diabetic foot. If infection spreads to deeper structures including the underlying bone, diabetic foot osteomyelitis (DFO) develops. Diabetic foot infection is the most frequent diabetes-related complication requiring hospitalisation and DFO is present in 44-68% of patients admitted into hospital (Peters, 2016; Lipsky et al., 2016). Furthermore, DFIs account for 60% of lower extremity amputations in developed countries (Peters, 2016). Prompt identification, rapid diagnosis, timely referral for specialist review and appropriate management strategies (Lipsky et al., 2016) are all vital steps in the quest to minimise the adverse outcomes associated with DFIs including limb-threatening infections and amputations (McIntosh and O'Loughlin, 2016).

Refer to appendix X for a classification of Diabetic Foot Infections.

Recommendations

63.1 All hospital, primary care and community settings should have antibiotic guidelines covering the care pathway for managing diabetic foot infections that take into account local patterns of resistance.
HSE Recommendation Evidence Grade: C

63.2 Diabetic foot infection must be diagnosed clinically, based on the presence of local or systemic signs or symptoms of inflammation.
HSE Recommendation Evidence Grade: C

63.3 If a diabetic foot infection is suspected and a wound is present, send a soft tissue or bone sample from the base of the debrided wound for microbiological examination. If this cannot be obtained, take a deep swab because it may provide useful information on the choice of antibiotic treatment.
HSE Recommendation Evidence Grade: C

63.4 Obtain plain X-rays of the foot in all cases of non-superficial diabetic foot infection to determine the extent of the diabetic foot problem.
HSE Recommendation Evidence Grade: C

Clinical Question 64: When first seeing a patient with a diabetic foot wound, what initial assessment should be undertaken to determine the presence of a diabetic

Evidence Statement

Peters (2016) stresses the importance of an initial diagnosis of DFI being made based upon clinical signs and symptoms, as the reliance on bloods, microbiological and radiological studies could lead to a delay in diagnosis. However, Peters (2016) also debates the challenges faced by clinicians when using clinical judgement; it is possible that the signs and symptoms of infection are less prevalent in people with diabetes. This may be due to the presence of foot ischaemia, neuropathy and immunopathy which could, theoretically, reduce the inflammatory response and mask the classic signs of infection (Peters, 2016). The Infectious Diseases Society of America (Lipsky et al., 2012) and the International Working Group on the Diabetic Foot (IWGDF) both concur that the diagnosis of DFIs should be based upon the presence of local and systemic signs and symptoms and on the symptoms of inflammation. Furthermore the severity of DFIs should be classified using the IDSA and IWGDF classification scheme (McIntosh and O'Loughlin, 2016).

Recommendations

64.1 At initial assessment of any infected foot, obtain vital signs and appropriate blood tests, debride the wound, probe and assess the depth and extent of the infection to establish its severity.
HSE Recommendation Evidence Grade: C

64.2 Assess the severity of any diabetic foot infection using the Infectious Diseases Society of America/International Working Group on the Diabetic Foot classification scheme.
HSE Recommendation Evidence Grade: C

64.3 At initial assessment measure arterial perfusion and decide whether and when further vascular assessment or revascularisation is needed.
HSE Recommendation Evidence Grade: C

64.4 Obtain cultures, preferably of a tissue specimen rather than a swab, of infected wounds to determine the causative microorganisms and their antibiotic sensitivity.
HSE Recommendation Evidence Grade: C

64.5 Repeat cultures are not indicated unless the patient is clinically not responding to treatment, or occasionally for infection control surveillance of resistant pathogens.
HSE Recommendation Evidence Grade: C

64.6 Send collected specimens to the microbiology laboratory promptly, in sterile transport containers, accompanied by clinical information on the type of specimen and location of the wound.
HSE Recommendation Evidence Grade: C

64.7 Avoid using results of soft tissue or sinus tract specimens for selecting antibiotic therapy for osteomyelitis as they do not accurately reflect bone culture results.
HSE Recommendation Evidence Grade: C

64.8 Consider osteomyelitis if the person with diabetes has a local infection, a deep foot wound or a chronic foot wound.
HSE Recommendation Evidence Grade: C

64.9 For an infected open wound, perform a probe-to-bone test. In a patient at low risk for osteomyelitis, a negative test largely rules out the diagnosis, while in a high-risk patient a positive test is largely diagnostic.
HSE Recommendation Evidence Grade: C

64.10 Markedly elevated serum inflammatory markers, especially erythrocyte sedimentation rate, are suggestive of osteomyelitis* in suspected cases.
HSE Recommendation Evidence Grade: C
**however be aware that osteomyelitis may be present in a person with diabetes with normal inflammatory markers.*

64.11 A definite diagnosis of bone infection usually requires positive results on microbiology, histology and examination of an aseptically obtained bone sample, but this is usually required only when the diagnosis is in doubt or determining the causative pathogen's antibiotic susceptibility is crucial.
HSE Recommendation Evidence Grade: C

64.12 A probable diagnosis of bone infection is reasonable if there are positive results on a combination of diagnostic tests, such as probe-to-bone, serum inflammatory markers, plain X-ray, MRI or radionuclide scanning.
HSE Recommendation Evidence Grade: C

64.13 Use MRI when an advanced imaging test is needed for diagnosing diabetic foot osteomyelitis or if osteomyelitis is suspected in a person with diabetes but is not confirmed by initial X-ray, consider an MRI to confirm the diagnosis.
HSE Recommendation Evidence Grade: C

64.14 When MRI is not available or contraindicated, consider a white blood cell-labelled radionuclide scan, or possibly SPECT/CT or 18 F- FDG PET/CT scans.
HSE Recommendation Evidence Grade: D

Clinical Question 65: How should foot infections be treated in persons with diabetes?

Evidence Statement

If a DFI is diagnosed, antibiotic treatment should be initiated as soon as possible. The National Institute for Health and Care Excellence (2016) guidelines state that all primary care settings should have care pathways for managing DFIs with specific antibiotic regimens which consider local issues of resistance. The antibiotic prescribed should be based on the causative pathogens and the severity of the infection (Lipsky et al., 2016). Furthermore, NICE recommend that choice of antibiotic treatment may be influenced by the care setting, patient preferences, the clinical situation and the patients' medical history (McIntosh and O'Loughlin, 2016).

Recommendations

65.1 Start antibiotic treatment for suspected diabetic foot infection as soon as possible. Take cultures and samples before, or as close as possible to, the start of antibiotic treatment.
HSE Recommendation Evidence Grade: C

65.2 Select specific antibiotic agents for treatment based on the likely or proven causative pathogens, their antibiotic susceptibilities, the clinical severity of the infection, evidence of efficacy of the agent for DFI and costs.
HSE Recommendation Evidence Grade: C

65.3 For mild diabetic foot infections, initially offer oral antibiotics with activity against gram-positive organisms.
HSE Recommendation Evidence Grade: C

65.4 A course of antibiotic therapy of 1-2 weeks is usually adequate for most mild and moderate infections.
HSE Recommendation Evidence Grade: C

65.5 Decide the targeted antibiotic regimen for diabetic foot infections based on the clinical response to antibiotics and the results of the microbiological examination.
HSE Recommendation Evidence Grade: C

65.6 Administer parenteral therapy initially for most severe infections and some moderate infections, with a switch to oral therapy when the infection is responding.
HSE Recommendation Evidence Grade: C

65.7 For moderate and severe diabetic foot infections, initially offer antibiotics with activity against gram-positive and gram-negative organisms, including anaerobic bacteria, as follows:

- moderate infections: base the route of administration on the clinical situation and the choice of antibiotic
- severe infections: start with intravenous antibiotics and then reassess, based on the clinical situation

HSE Recommendation Evidence Grade: C

65.8 Offer prolonged antibiotic treatment (usually 6 weeks) to patients with diabetes and osteomyelitis, according to local protocols.
HSE Recommendation Evidence Grade: C

65.9 Consult a surgical specialist in selected cases of moderate, and all cases of severe diabetic foot infections.
HSE Recommendation Evidence Grade: C

65.10 Perform urgent surgical interventions in cases of deep abscesses, compartment syndrome and virtually all necrotising soft tissue infections.
HSE Recommendation Evidence Grade: C

65.11 Consider surgical intervention in cases of osteomyelitis accompanied by: spreading soft tissue infection, destroyed soft tissue envelope, progressive bone destruction on X-ray, or bone protruding through the ulcer.
HSE Recommendation Evidence Grade: C

65.12 For diabetic foot osteomyelitis, 6 weeks of antibiotic therapy is recommended for patients who do not undergo resection of infected bone and no more than a week of antibiotic treatment if all infected bone is resected.
HSE Recommendation Evidence Grade: C

65.13 The use of adjunctive treatments for diabetic foot infection is not recommended.
HSE Recommendation Evidence Grade: C

65.14 While virtually all clinically infected diabetic foot wounds require antimicrobial therapy, do not treat clinically uninfected wounds with antimicrobial therapy.
HSE Recommendation Evidence Grade: C

65.15 Do not offer antibiotics to *prevent* diabetic foot infections.
HSE Recommendation Evidence Grade: C

65.16 Do not select a specific type of dressing, e.g. an antimicrobial dressing, for a diabetic foot ulcer with the aim of preventing an infection.
HSE Recommendation Evidence Grade: C

2.3.3 Peripheral Arterial Disease

Clinical Question 66: How should Peripheral Arterial Disease be assessed and managed in patients with foot ulcers in diabetes?

Evidence Statement

The 2016 Vascular Advisory Group (VAG) guideline for the diagnosis and management of patients with peripheral arterial disease (PAD) provided the evidence for this question. These guidelines specifically state the following:

- all patients with suspected PAD should have an appropriate assessment and accurate diagnosis
- those with confirmed disease require appropriate management, including measures aimed at reducing cardiovascular risk, improving symptoms and making progression of disease less likely
- those with critical ischaemia (rest pain, necrosis or gangrene) are at high risk of progressing to amputation and need urgent/emergency referral for a vascular surgical opinion
- patients with PAD are at increased risk of having other forms of occlusive vascular disease (coronary heart disease, cerebro-vascular disease) and if they have symptoms of these require appropriate assessment and management (IWGDF, 2015)

Recommendations

66.1 Patients with signs of PAD and foot infection are at particularly high risk for major limb amputation and require emergency treatment.
HSE Recommendation Evidence Grade: C

66.2 All patients with diabetes and an ischaemic foot ulcer should receive comprehensive cardiovascular risk management including support for cessation of smoking, treatment of hypertension and prescription of a statin, as well as anti-coagulant, anti-platelet therapies.
HSE Recommendation Evidence Grade: C

66.3 Examine a patient with diabetes annually for the presence of peripheral artery disease; this should include as a minimum, taking a history and palpating foot pulses.
HSE Recommendation Evidence Grade: C

66.4 Evaluate a patient with diabetes and a foot ulcer for the presence of PAD. As part of this examination, determine ankle or pedal Doppler arterial waveforms; measure both ankle systolic pressure and systolic ankle brachial index (ABI) and toe brachial index (TBI).
HSE Recommendation Evidence Grade: C

66.5 The use of bedside non-invasive tests to exclude PAD is recommended. No single modality has been shown to be optimal. Measuring ABI (with <0.9 considered abnormal) is useful for the detection of PAD. Tests that largely exclude PAD are the presence of ABI 0.9-1.3, toe brachial index (TBI) ≥0.75 and the presence of triphasic pedal Doppler arterial waveforms.
HSE Recommendation Evidence Grade: C

66.6 No specific symptoms or signs of PAD can reliably predict healing of the ulcer in patients with a foot ulcer and diabetes and PAD. However, one of the following simple bedside tests should be used to inform the patient and clinician about the healing potential of the ulcer. Any of the following findings; a skin perfusion pressure ≥40mmHg; a toe pressure ≥30mmHg; or, a TcPO2 ≥25 mmHg, increases the pre-test probability of healing by at least 25%.
HSE Recommendation Evidence Grade: C

66.7 Consider urgent vascular imaging and revascularisation in patients with a foot ulcer in diabetes where the toe pressure is <30mmHg or the TcPO2 <25 mmHg.
HSE Recommendation Evidence Grade: C

66.8 Consider vascular imaging and revascularisation in all patients with a foot ulcer in diabetes and PAD, irrespective of the results of bedside tests, when the ulcer does not improve within 6 weeks despite optimal management.
HSE Recommendation Evidence Grade: C

66.9 Diabetic microangiopathy should not be considered to be the cause of poor wound healing in patients with a foot ulcer.
HSE Recommendation Evidence Grade: C

66.10 In patients with a non-healing ulcer with either an ankle pressure <50mmHg or ABI <0.5 consider urgent vascular imaging and revascularisation.
HSE Recommendation Evidence Grade: C

66.11 Colour Doppler ultrasound and angiography can each be used to obtain anatomical information when revascularisation is being considered. The entire lower extremity arterial circulation should be evaluated, with detailed visualisation of below-the-knee and pedal arteries.
HSE Recommendation Evidence Grade: C

66.12 The aim of revascularisation is to restore direct flow to at least one of the foot arteries, preferably the artery that supplies the anatomical region of the wound, with the aim of achieving a minimum skin perfusion pressure ≥40mmHg; a toe pressure ≥30mmHg; or, a TcPO2 ≥25 mmHg.
HSE Recommendation Evidence Grade: C

66.13 A centre treating patients with a foot ulcer in diabetes should have the expertise in and rapid access to facilities necessary to diagnose and treat PAD; both endovascular techniques and bypass surgery should be available.
HSE Recommendation Evidence Grade: C

66.14 After a revascularisation procedure for a foot ulcer in diabetes, the patient should be treated by a multidisciplinary team as part of a comprehensive care plan.
HSE Recommendation Evidence Grade: C

66.15 Avoid revascularisation in patients where the risk-benefit ratio for the probability of success is unfavourable.
HSE Recommendation Evidence Grade: C

2.3.4 Charcot Neuroarthropathy

Clinical Question 67: How should Charcot neuroarthropathy be assessed and managed in patients with foot ulcers in diabetes?

Evidence Statement

There is no single cause for the development of the Charcot neuroarthropathy otherwise known as Charcot foot, but there are significant factors that lead to its occurrence. A prominent theory is that once triggered in an at risk patient, the development of Charcot foot occurs through a process of uncontrolled inflammation in the foot, resulting in osteolysis that is directly responsible for the progressive fracture and dislocation of any of the foot joints (Jeffcoate et al., 2005). According to Rogers et al. (2011) the diagnosis of Charcot foot is primarily based on history and clinical findings, such as inflammation. Initial clinical assessment should entail X-rays which will detect subtle fractures or subluxations if no obvious pathology is visible, augment with MRI or nuclear imaging which can confirm initial clinical suspicions.

Recommendations

67.1 Be aware that if a person with diabetes fractures their foot or ankle, it may progress to Charcot neuroarthropathy.
HSE Recommendation Evidence Grade: C

67.2 Suspect acute Charcot neuroarthropathy if there is redness, warmth, swelling or deformity (in particular, when the skin is intact), especially in the presence of peripheral neuropathy or renal failure. Think about acute Charcot neuroarthropathy even when deformity is not present or pain is not reported.
HSE Recommendation Evidence Grade: C

67.3 To confirm the diagnosis of acute Charcot neuroarthropathy, refer the patient within 1 working day to the multidisciplinary foot care service for triage within 1 further working day. Offer non-weight-bearing treatment until definitive treatment can be started by the multidisciplinary foot care service.
HSE Recommendation Evidence Grade: C

67.4 If acute Charcot neuroarthropathy is suspected, arrange a weight-bearing X-ray of the affected foot and ankle. Consider an MRI if the X-ray is normal but Charcot neuroarthropathy is still suspected.
HSE Recommendation Evidence Grade: C

67.5 If the multidisciplinary foot care service suspect acute Charcot neuroarthropathy, offer treatment with a non-removable offloading device. If a non-removable device is not advisable because of the clinical, or the person's circumstances, consider treatment with a removable offloading device.
HSE Recommendation Evidence Grade: C

67.6 Monitor the treatment of acute Charcot neuroarthropathy using clinical assessment. This should include measuring foot–skin temperature difference and taking serial X-rays until the acute Charcot neuroarthropathy resolves. Acute Charcot neuroarthropathy is likely to resolve when there is a sustained temperature difference of less than 2 degrees between both feet and when X-ray changes show no further progression.
HSE Recommendation Evidence Grade: C

67.7 Patients who have a foot deformity that may be the result of a previous Charcot neuroarthropathy are at high risk of ulceration and should be cared for by the foot protection service.
HSE Recommendation Evidence Grade: C

2.3.5 Casting and Offloading

Clinical Question 68: Are casting or prefabricated offloading devices, effective techniques to heal plantar foot ulcers in patients with diabetes?

Evidence Statement

The National Institute for Health and Clinical Excellence guidelines (2016) and the guidelines from the IWGDF (2015) provided the evidence to answer this statement. The effectiveness of offloading devices depends in part, upon patient tolerability and compliance of use, so it is inappropriate to recommend specific devices. The use of total contact non-removable casting should be guided by the population identified namely; non-infected, non-ischaemic plantar diabetic foot ulcers. Clinicians must consider and monitor for the development of pressure ulcers in patients who have neuropathic foot ulcers (NICE, 2016).

There is no evidence to indicate the superiority of using a non-removable versus removable knee-high devices to heal plantar foot ulcers, as long as an appropriate foot device interface is maintained. Adverse effects of offloading devices must be considered though the benefits of effective and expedited healing outweigh potential harm. Many patients may prefer not to use a non-removable knee-high device as it limits them in their daily life, for example with sleeping, bathing, or driving a car. Wound care and inspection can take place at any time with a removable device.

If there is any concern relating to wound healing, or when both mild infection and mild PAD is present, non-removable offloading devices are not recommended. If severe infection and/or severe ischaemic foot ulcers are present, the infection and ischaemia should first be resolved before offloading can be applied.

The benefits of treatment with ankle-high offloading shoes compared to conventional shoes will likely outweigh potential harm, but compared to knee-high devices the lower efficacy and/or longer healing times associated with such interventions poses a higher risk for infection and hospitalisation. The cost of treatment is relatively low for forefoot offloading shoes and cast shoes, both requiring no replacement during treatment. Costs for custom-made temporary shoes are relatively higher (IWGDF, 2015).

Recommendations

68.1 Offload with a non-removable knee-high device with an appropriate foot-device interface, to heal a neuropathic plantar forefoot ulcer without ischaemia or uncontrolled infection in a patient with diabetes.

HSE Recommendation Evidence Grade: C

68.2 For an interim period, offer an alternative offloading device until casting can be provided.
HSE Recommendation Evidence Grade: C

68.3 When a non-removable knee-high device is contraindicated or not tolerated by the patient, consider offloading with a removable knee-high walker with an appropriate foot device interface to heal a neuropathic plantar forefoot ulcer in a patient with diabetes.
HSE Recommendation Evidence Grade: C

68.4 When a knee-high device is contraindicated or cannot be tolerated by the patient, consider offloading with a forefoot offloading shoe, cast shoe, or custom-made temporary shoe to heal a neuropathic plantar forefoot ulcer.
HSE Recommendation Evidence Grade: C

All patients wearing these devices should be given education and support relating to the benefits of wearing these devices and the risks of non-adherence.

68.5 Consider referral for orthopaedic opinion/surgical intervention to heal neuropathic plantar foot ulcer and toe ulcers where significant deformity exists and/or conservative treatment fails.
HSE Recommendation Evidence Grade: C

Clinical Question 69: Are any other offloading techniques effective to prevent foot ulcers in patients with diabetes?

Evidence Statement

There is a lack of research evidence to determine the added effect of felted foam. However, since there are no adverse effects or complications associated with using felted foam, patients may prefer to use it, as it is easy to use and non-limiting. Felted foam requires frequent replacement and can only be used in conjunction with appropriate footwear and not as a single treatment modality (IWGDF, 2015).

Recommendations

69.1 If other forms of biomechanical relief are not available, consider using felted foam in combination with appropriate footwear to offload and heal a neuropathic foot ulcer without ischaemia or uncontrolled infection in a patient with diabetes.
HSE Recommendation Evidence Grade: C

69.2 Use pressure-redistributing devices and strategies to minimise the risk of pressure ulcers developing.
HSE Recommendation Evidence Grade: C

69.3 It is important that consideration is given to possible adverse effects of some of the above mentioned interventions, which include the use of non-removable and removable knee-high offloading devices, and all surgical offloading procedures. These possible adverse effects should be discussed with the patient for informed shared-decision making.
HSE Recommendation Evidence Grade: C

3. Pressure Ulcers

A pressure ulcer is localised injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear (National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance [NPUAP/EPUAP/PPPIA] 2014).

It is important to be able to provide a clear definition of what the terms 'avoidable and 'unavoidable' mean. This guideline will use the UK Department of Health definitions of these terms. This is a modified version of the Avoidable and Unavoidable Pressure Ulcers definitions from the Centre for Medicare and Medicaid (Centre for Medicare and Medicaid, 2004), adapted in the context of the Irish setting. The modified definitions are:

Avoidable Pressure Ulcer
"Avoidable means that the person receiving care developed a pressure ulcer and the provider of care did not do one of the following: evaluate the person's clinical condition and pressure ulcer risk factors; plan and implement interventions that are consistent with the persons' needs and goals, and recognised standards of practice; monitor and evaluate the impact of the interventions; or revise the interventions as appropriate."

Unavoidable Pressure Ulcer
"Unavoidable means that the person receiving care developed a pressure ulcer even though the provider of the care had evaluated the person's clinical condition and pressure ulcer risk factors; planned and implemented interventions that are consistent with the person's needs and goals; and recognised standards of practice; monitored and evaluated the impact of the interventions; and revised the approaches as appropriate; or the individual person refused to adhere to prevention strategies in spite of education of the consequences of non-adherence"

- Critical illness with haemodynamic or spinal instability may preclude turning or repositioning and lead to unavoidable pressure ulcers
- Patients who refuse to be repositioned or to maintain a position change may also develop unavoidable pressure ulcers
- Patients following an end of life care pathways or who meet the criteria, are deemed to be terminally ill and may not be able to tolerate repositioning at the optimum frequency for pressure ulcer prevention In these cases, pressure damage may be an unavoidable consequence of their terminal status as the condition of skin failure does exist

Unavoidable damage is also possible where the patient:

- Has not previously been seen by a clinician
- Has mental capacity and has refused assessment and/or has not complied with the agreed plan of care
- Is known to a clinician but an acute/critical event occurs affecting mobility or the ability to reposition. This may include the patient being undiscovered following a fall or loss of consciousness due to for example unexpected collapse, drug misuse or alcohol misuse (NPUAP/EPUAP/PPPIA, 2014).

In determining whether the pressure ulcer is avoidable, leaders, commissioners, regulators or others could request to see documented evidence that the requisite actions outlined in the avoidable definition have been demonstrated.

The majority of recommendations in this section are based upon international evidence derived from the guideline document "Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline" (NPUAP/EPUAP/PPPIA, 2014). Recommendations not derived from this document are distinguished by having an HSE Recommendation Evidence Grade other than C.

This section of the guideline addresses each element of the SSKIN bundle The SSKIN bundle outlines 5 critical areas of pressure ulcer prevention:

- **S:** Skin assessment
- **S:** Surface
- **K**: Keep moving
- **I:** Incontinence
- **N:** Nutrition

Refer to appendix XI for an outline of the SSKIN bundle.

The following recommendations are largely derived from the NPUAP/EPUAP/PPPIA (2014) "Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline". The reader should be aware that the grading of evidence in this section uses the 2014 NPUAP/EPUAP/PPPIA guideline grading scheme and hence is distinctly different to the grading used in the rest of this guideline.

Refer to the tables below for an explanation of the Evidence Grades used in the NPUAP/EPUAP/PPPIA (2014) guidelines.

Levels of Evidence, Strengths of Evidence and Strengths of Recommendations

Full explanation of the methodology is available in the full *Clinical Practice Guideline*. Individual studies were assigned a '***level of evidence***' based on study design and quality, using a classification system adapted from Sackett (1989)[2].

Levels of Evidence			
	Intervention Studies	***Diagnostic studies***	***Prognostic studies***
Level 1	Randomized trial(s) with clear-cut results and low risk of error OR systematic literature review or meta-analysis according to the Cochrane methodology or meeting at least 9 out of 11 quality criteria according to AMSTAR appraisal tool.	Systematic review of high quality (cross sectional) studies according to the quality assessment tools with consistently applied reference standard and blinding.	Systematic review of high quality (longitudinal) prospective cohort studies according to the quality assessment tools.
Level 2	Randomized trial(s) with uncertain results and moderate to high risk of error.	Individual high quality (cross sectional) studies according to the quality assessment tools with consistently applied reference standard and blinding among consecutive persons.	A prospective cohort study.
Level 3	Non randomized trial(s) with concurrent or contemporaneous controls.	Non-consecutive studies, or studies without consistently applied reference standards.	Analysis of prognostic factors amongst persons in a single arm of a randomized controlled trial.
Level 4	Non randomized trial(s) with historical controls.	Case-control studies, or poor/ non-independent reference standard.	Case-series or case-control studies, or poor quality prognostic cohort study, retrospective cohort study.
Level 5	Case series with no controls. Specify number of subjects.	Mechanism-based reasoning, study of diagnostic yield (no reference standard).	Not applicable.

The full 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.

Strengths of Evidence	
A	The recommendation is supported by direct scientific evidence from properly designed and implemented controlled trials on pressure ulcers in humans (or humans at risk for pressure ulcers), providing statistical results that consistently support the recommendation (Level 1 studies required).
B	The recommendation is supported by direct scientific evidence from properly designed and implemented clinical series on pressure ulcers in humans (or humans at risk for pressure ulcers) providing statistical results that consistently support the recommendation. (Level 2, 3, 4, 5 studies)
C	The recommendation is supported by indirect evidence (e.g., studies in healthy humans, humans with other types of chronic wounds, animal models) and/or expert opinion
Strengths of Recommendation	
↑↑	Strong positive recommendation: definitely do it
↑	Weak positive recommendation: probably do it
↔	No specific recommendation
↓	Weak negative recommendation: probably don't do it
↓↓	Strong negative recommendation: definitely don't it

3.1 Risk Factors and Risk Assessment

Clinical Question 70: How should patients be assessed for risk of pressure ulcer development?

Evidence Statement:
To accurately identify which patients are at risk of developing a pressure ulcer requires understanding of what is meant by risk. Risk may be defined as the probability of a patient developing a specific problem e.g. a pressure ulcer (Burt, 2001). Owing to the expense of addressing risk and the finite supply of healthcare resources, it is imperative that clinicians correctly identify those in need of prevention strategies.

The exact predisposition of an individual to the risk of pressure ulcer development remains unclear, although evidence suggests that pressure ulcers will only occur if the individual cannot withstand the effects of pressure and shear (Defloor, 1999). This ability had been defined by Braden and Bergstrom as the person's "tissue tolerance", which they suggest is affected by both intrinsic and extrinsic factors. It is well documented in the literature that there are numerous potential risk factors it has been postulated that some specific factors play a key role in the development of pressure ulcers (Moore et al., 2013 (a); Shanley, 2012).

Recommendations
70.1 Conduct a structured risk assessment as soon as possible (but within a maximum of SIX hours after presentation and at first assessment in the community) to identify patients at risk of developing pressure ulcers.
HSE Recommendation Evidence Grade: D

Please see recommendation 71.1 for further details.

70.2 Repeat the risk assessment as often as required based on assessment of the patient's acuity. If the patient's condition is unstable, then re-assess every 48-72 hours until stable; thereafter, weekly reassessment should be conducted.
HSE Recommendation Evidence Grade: D

70.3 Conduct a reassessment if there is any significant change in the patient's condition.
HSE Recommendation Evidence Grade: D

70.4 Include a comprehensive skin assessment as part of every risk assessment to evaluate any alterations to intact skin.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:41)

70.5 Use a structured approach to risk assessment that is refined through the use of clinical judgment and informed by knowledge of relevant risk factors.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:42)

70.6 All risk assessments must be documented.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:41)

70.7 Develop and implement a risk based prevention plan for patients identified as being at risk of developing pressure ulcers
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:42)

3.2 Risk Assessment Tools

Clinical Question 71: What tools are recommended for use in pressure ulcer risk assessment?

Evidence Statement

Recommendations below are based on the following evidence. Pressure ulcer risk assessment should be a part of the assessment process used to identify patients at risk of pressure ulcer (NPUAP/EPUAP/PPPIA, 2014). Checklists regularly form the basis of risk assessments, alerting clinicians to the most common predisposing risk factors for pressure ulcer development. These checklists are commonly developed into risk assessment tools e.g. the Norton Scale (Norton et al., 1962), the Waterlow risk assessment scale (Gould et al., 2002) and the Braden scale (Braden and Bergstrom 1987). There is a lack of clarity on the most important indicators of risk for PU development (Defloor and Grypdonck, 2004). Consequently it is not surprising that there are currently almost 90 risk assessment scales in use, most of which are based on the seminal work of Norton (Norton et al., 1962), or have been designed in response to a review of the literature (Henoch and Gustafsson, 2003). It is clear however, that the risk factors that predispose a patient to developing a pressure ulcer will vary among patients in different clinical settings (Bergstrom et al., 1992). Nonetheless, use of a risk assessment tool is recommended in many international pressure ulcer prevention guidelines (Bergstrom et al., 1992; Rycroft-Malone and McInness 2000; NPUAP/EPUAP/PPPIA, 2014; NICE 2014). The ideal risk assessment tool should be reliable and valid, sensitive and specific (NPUAP, 1989). The tool must accurately and consistently identify those patients who are at risk, as well as those not at risk (Defloor and Schoonhoven, 2004).

Recommendations

71.1 When using a risk assessment tool, select a tool that focuses on activity and mobility (including sensation and ability to move).

HSE Recommendation Evidence Grade: D

71.2 Recognise additional risk factors and use clinical judgment when using a risk assessment tool.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:53)

Good Practice Point

Do not rely on the results of a risk assessment tool alone when assessing a patient's pressure ulcer risk

3.3 Pressure Ulcer Classification Systems

Clinical Question 72: What classification system should be used for the staging of pressure ulcers?

Evidence Statement

While the terms grading, classifying, categorising and staging are used interchangeably in regard to pressure ulcer description, for the purpose of this document the terms category/staging are used.

Pressure ulcer category/staging systems are commonly used in clinical practice to assess the severity of pressure ulcer damage. The origins of these systems stem from the work of Shea (1975). Since then, there has been much modification of this work resulting in the emergence of a wide variety of systems that are now in use (Moore, 2005). These systems are intended for use as diagnostic tools and not as measures of wound healing outcomes. The central issues of concern regarding the use of the category/staging systems relate to reliability and validity. It is important that they measure pressure ulcer severity accurately and consistently if they are to be of value in clinical decision-making (Stausberg et al., 2007). Overall, there is only moderate agreement among nurses in their use of grading systems, over a variety of different tools (Moore, 2005). Therefore to date, there is no single tool that has been proven to be 100 per cent reliable, yet their use is still advocated in order to potentiate consistency in pressure ulcer assessment.

There is much debate within the international literature pertaining to the classification of pressure ulcers. The working group acknowledges this debate, in addition to the debate and that pertaining to the use of terminology such as pressure injury versus pressure ulcers. Furthermore, the working group was also cognisant of the current work in updating the ICD 10 coding to ICD 11 and the potential impact this may have on future coding of pressure ulcers. The working group was also acutely aware that there was a need to synchronise category/staging of pressure ulcers within the current reporting systems within the Health Service in Ireland. Ultimately, the working group and the expert stakeholder group had one goal in mind which was to provide clear guidance on pressure ulcer categorisation/staging for practitioners, so that there is a standardised approach and language employed within the Irish Health Care context. In doing this, the working group was also very aware that there are clinical challenges in assessing and recognising suspected deep pressure and shear induced tissue damage, when this is first suspected to when it fully evolves. Thus, consideration was given to all of these elements in making recommendations for pressure ulcer categorisation/staging within these guidelines. The final recommendation has been adapted from the EPUAP (2009) system and the ICD-10 coding (World Health Organisation, 2010).

The following pressure ulcer category/staging system is recommended, and will be known as the "HSE 2018 Pressure Ulcer Category/Staging Recommendation"

Category/Stage I: *Non-blanchable redness of intact skin*
Intact skin with non-blanchable redness of a localised area usually over a bony prominence. Discolouration of the skin, warmth, odema, hardness or pain may also be present. Darkly pigmented skin may not have visible blanching.
Further description: The area may be painful, firm, soft, warmer or cooler as compared to adjacent tissue. Category/Stage I may be difficult to detect in individuals with dark skin tones. May indicate 'at risk' persons.

Category/Stage II: *Partial thickness skin loss or blister*
Partial thickness loss of dermis presenting as, a shallow open ulcer with a red pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled or sero-sanginous filled blister.
Further description: Presents as a shiny or dry shallow ulcer without slough or bruising. This category should not be used to describe skin tears, tape burns (skin stripping), incontinence associated dermatitis, maceration or excoriation.

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

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

Suspected deep pressure and shear induced tissue damage, depth unknown
In individuals with non-blanchable redness and purple/maroon discoloration of intact skin combined with a history of prolonged, unrelieved pressure/shear, this skin change may be an indication of emerging, more severe pressure ulceration i.e. an emerging

Category/Stage III or IV Pressure Ulcer. Clear recording of the exact nature of the visible skin changes and stating that these changes may be an indication of emerging more severe pressure ulceration should be documented in the patient's health record. Clear recording of the exact nature of the visible skin changes, including recording of the risk that these changes may be an indication of emerging more severe pressure ulceration, should be documented in the patients health record. These observations should be recorded in tandem with information pertaining to the patient history of prolonged, unrelieved pressure/shear. It is estimated that it could take **3-10 days** from the initial insult causing the damage, to become a **Category/Stage III or IV** Pressure Ulcer (Black et al., 2015).

Please see appendix XI for a pressure ulcer staging chart.

Recommendations

72.1 Clinicians should grade and record pressure ulcers using the adapted 2009 International NPUAP- EPUAP Pressure Ulcer Classification System as described above.
HSE Recommendation Evidence Grade: D

72.2 Non-blanchable purple/maroon discolouration of intact skin are important clinical signs for subsequent tissue breakdown. Therefore, such skin impairment should not be definitively staged until the full extent of tissue damage is visible. Thus, very regular reassessment of the skin is important to facilitate definitive pressure ulcer staging.
HSE Recommendation Evidence Grade: D

ALERT…

Suspected deep pressure and shear induced tissue damage, depth unknown

In individuals with non-blanchable redness and purple/maroon discoloration of intact skin combined with a history of prolonged, unrelieved pressure/shear, this skin change may be an indication of emerging, more severe pressure ulceration i.e. an emerging **Category/Stage III or IV Pressure Ulcer**. Clear recording of the exact nature of the visible skin changes and stating that these changes may be an indication of emerging more severe pressure ulceration should be documented in the patient's health record. These observations should be recorded in tandem with information pertaining to the patient history of prolonged, unrelieved pressure/shear. It is estimated that it could take **3-10 days** from the initial insult causing the damage, to become a **Category/Stage III or IV Pressure Ulcer** (Black et al., 2015).

Record what you observe in Patient's Notes / Incident Form

72.3 Differentiate pressure ulcers from other types of wounds.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014: 124)

72.4 Rely on assessment of skin temperature, change in tissue consistency and pain rather than identification of non-blanchable erythema when classifying Category/Stage I pressure ulcers in patients with darkly pigmented skin.
HSE Recommendation Evidence Grade: D

72.5 Assess skin heat, tenderness, and change in tissue consistency and pain to assist in identifying the severity of Category/Stage II to IV pressure ulcers in patients with darkly pigmented skin.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:60)

72.6 Use the International NPUAP/EPUAP Pressure Ulcer Classification System (2009) to classify and document the level of tissue loss in medical device related pressure ulcers.
HSE Recommendation Evidence Grade:D

72.7 Do not use the International NPUAP/EPUAP Pressure Ulcer Classification System (2009) to describe tissue loss in wounds other than pressure ulcers.
HSE Recommendation Evidence Grade: D

72.8 Staging of pressure ulcers on mucous membranes is not recommended.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:126)

72.9 Verify that there is clinical agreement in pressure ulcer classification amongst the clinicians responsible for classifying pressure ulcers.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = B; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:124)

3.4 Skin and Tissue Assessment

The following section addresses the assessment of skin, which represents the first "S" of the SSKIN bundle.

Clinical Question 73: What factors should be considered when assessing the skin of a patient at risk of developing a pressure ulcer?

Evidence Statement

Key issues in skin assessment relate to the importance of recognising the presence of early pressure ulcer damage, the presence of a pressure ulcer, and in differentiating pressure ulcer damage from other forms of tissue damage (Pedley, 2004). Pressure ulcers occur over bony prominences and the presence of tissue damage in other areas of the body should alert the clinician to other potential causes of the damage (Defloor and Schoonhoven, 2004). An ideal example of this is incontinence, which causes maceration and excoriation of the skin. The relevance of distinguishing urine and faecal skin damage from pressure damage is that the treatment for incontinence differs from that of pressure ulceration. This highlights the importance of correct identification of the nature of the causative factor (Defloor and Schoonhoven, 2004).

Recommendations

73.1 Inspect skin for erythema in patients identified as being at risk of pressure ulceration.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:66)

Caution: Avoid positioning the patient on an area of erythema wherever possible.

73.2 Differentiate the cause and extent of erythema

- blanchable vs non blanchable erythema.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:61)

Alert!

When documenting skin redness, differentiate between blanching or non-blanching redness

73.3 Use the finger or the disc method to assess whether skin is blanchable or non-blanchable

- finger pressure method — a finger is pressed on the erythema for three seconds and blanching is assessed following removal of the finger

NPUAP/EPUAP/PPPIARecommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:61)

73.4 Include the following factors in every skin assessment:

- skin temperature
- oedema
- change in tissue consistency in relation to surrounding tissue

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = B; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:62)

73.5 When conducting a skin assessment in a patient with darkly pigmented skin prioritise assessment of:

- skin temperature
- oedema
- change in tissue consistency in relation to surrounding tissue because it is not always possible to identify erythema in darkly pigmented skin

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = B; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:62)

73.6 Assess localised pain as part of every skin assessment.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:63)

73.7 Inspect the skin under and around medical devices at least twice daily for the signs of pressure-related injury on the surrounding tissue.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:64)

Please see section 3.10 for recommendations on moisture associated skin damage.

73.8 Document the findings of all comprehensive skin assessments.
HSE Recommendation Evidence Grade: D

Clinical Question 74: When and at what frequency should a skin assessment be conducted in a patient at risk of pressure ulcers?

Evidence Statement

Skin assessment is critical for pressure ulcer prevention, classification and management. The condition of the skin can be indicative of early signs of pressure damage hence routine assessment enables the clinician to identify early signs of skin alteration, particularly pressure ulcers. A comprehensive skin assessment should be carried out as soon as possible but within 6 hours of admission (or first visit in community settings).

Recommendations

74.1 In patients at risk of pressure ulcers conduct a comprehensive skin assessment:

- as soon as possible but within 6 hours of presentation (or first visit in community settings)
- as part of every risk assessment
- on an ongoing based on the clinical setting and the patient's degree of risk and prior to the patient's discharge

HSE Recommendation Evidence Grade: D

74.2 Increase the frequency of skin assessments in response to any deterioration in overall condition.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:64)

74.3 Conduct more frequent (greater than twice daily) skin assessments at the skin-device interface in patients vulnerable to fluid shifts and/or exhibiting signs of localised/generalised oedema.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:64)

Clinical Question 75: What components/criteria should be included in the assessment and monitoring of a pressure ulcer?

Evidence Statement

Accurate and on-going wound assessment is essential in order to correctly identify the underlying aetiology of the wound and the potentially compounding patient factors that may delay healing (Stockton and Flynn, 2009). Once this is established, the plan of care may be developed, implemented and subsequently evaluated. A comprehensive initial assessment of the individual with a pressure ulcer should be undertaken. 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 of developing additional pressure ulcers
- psychological health, behaviour 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 manoeuvres
- 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

Please see the section 1.3 of General Wounds, for comprehensive guidance on wound assessment in addition to the following recommendations.

Recommendations

75.1 Assess the pressure ulcer at each dressing change, measure at least weekly.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:131)

75.2 If unsure of the pressure ulcer stage, the skin/wound should be checked at a minimum every 24 hours initially.
HSE Recommendation Evidence Grade: D

75.3 Document the results of all wound assessments.
HSE Recommendation Evidence Grade:D

75.4 At 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).
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:131)

75.5 Address signs of tissue deterioration immediately.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:131)

75.6 Assess and document physical characteristics including:

- location
- category/stage
- size
- tissue type(s)
- colour
- peri-wound condition
- wound edges
- sinus tracts
- undermining
- tunnelling
- exudate
- odour

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:131)

75.7 Position the patient in a consistent neutral position for wound measurement.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:132)

75.8 Select a uniform, consistent method for measuring wound length and width or wound area to facilitate meaningful comparisons of wound measurements across time.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = B; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:132)

75.9 Select a consistent, uniform method for measuring depth.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:133)

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

75.10 Consider further diagnostic investigation of wound bed tissue when healing does not progress.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPIA 2014:133)

75.11 Use the findings of a pressure ulcer assessment to plan and document interventions that will best promote healing.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:133)

75.12 Reevaluate the pressure ulcer assessment plan if the pressure ulcer does not show signs of healing within two weeks.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:133)

75.13 Use clinical judgment to assess signs of healing such as decreasing amount of exudate, decreasing wound size, and improvement in wound bed tissue.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:134)

75.14 Consider using baseline and serial photographs to monitor pressure ulcer healing over time.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence=C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:134)

Please refer to section 2.8.1.3 for further details on wound assessment and measurement.

3.5 The Role of Surfaces in the Prevention and Management of Pressure Ulcers

The following section addresses the role of support surfaces in pressure ulcer development, which represents the second "S" (surface) in the SSKIN bundle.

Clinical Question 76: What factors should be considered in selecting support surfaces for the prevention and treatment of pressure ulcers?

Evidence Statement

Pressure redistribution is created by two concepts: immersion and envelopment. Immersion is a measure of how deep one sinks into the support surface. If the material is too soft the body may 'bottom out' (Mc Cluskey and Mc Carthy, 2012). In addition, if the material is too hard the body cannot sink into it, thus remains on top of the material resulting in an increased tissue deformation (Mc Cluskey and Mc Carthy, 2012). The thickness of the material also plays an important role; a material that is too thin will not enable any real immersion to occur. Envelopment is the ability of a support surface to deform around and encompass the contours of the human body (Moore et al., 2013a). In doing so the surface attempts to equalise pressure. Mattresses or cushions with the ability to encompass the body structures have better pressure redistributing features (Dowsett and Newton, 2005).

Recommendations

76.1 Select a support surface that meets the individual's needs. Consider the individual's need for pressure redistribution based on following factors:

- level of immobility and inactivity
- need for microclimate control and shear reduction
- size and weight of the individual
- risk for development of new pressure ulcers
- number, severity, and location of existing pressure ulcer(s)

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:104)

Selection of a support surface should be individualised based on the factors detailed in the above recommendation statement. See below for recommendations on selecting support surfaces specifically for individuals with existing pressure ulcers**.**

76.2 Choose a support surface that is compatible with the care setting.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:104)

Consider the weight of the bed, the structure of the building, the width of doors, the availability of uninterrupted electrical power, and safe location for the pump/motor, including its ventilation. Contingency plans should be in place in the event of power failure.

76.3 Examine the appropriateness and functionality of the support surface on every encounter with the individual.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:105)

76.4 Identify and prevent potential complications of support surface use.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:105)

Proper selection and operation of support surfaces is the key to preventing complications.

76.5 Verify that the support surface is being used within its functional life span, as indicated by the manufacturer's recommended test method (or other industry recognised test method) before use of the support surface.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:105)

76.6 Continue to reposition individuals placed on a pressure redistribution support surface.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:105)

Repositioning is still required for pressure relief and comfort when a support surface is in use. Frequency of repositioning may alter as a result of using a support surface.

76.7 Choose positioning devices and incontinence pads, clothing and bed linen that are compatible with the support surface. Limit the amount of linen and pads placed on the bed.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:105)

76.8 Use a high specification reactive foam mattress rather than a non-high specification reactive foam mattress for all patients assessed as being at risk for pressure ulcer development.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = A; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:106)

76.9 Review the characteristics of foam mattresses used in the facility for pressure ulcer prevention to ensure they are high specification.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:106)

76.10 Consider using reactive support surfaces for patients assessed as being at risk for pressure ulcer development.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:108)

76.11 Use an active support surface (overlay or mattress) for patients at higher risk of pressure ulcer development when frequent manual repositioning is not possible.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = B; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:108)

76.12 Wherever possible, do not position a patient on an existing pressure ulcer.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:109)

76.13 Consider replacing the mattress with a support surface that provides more effective pressure redistribution, shear reduction, and microclimate control for the patient if s/he:

- cannot be positioned off the existing pressure ulcer
- has pressure ulcers on two or more turning surfaces (e.g. the sacrum and trochanter) that limit turning options
- fails to heal or demonstrates ulcer deterioration despite appropriate comprehensive care
- is at high risk for additional pressure ulcers
- 'bottoms out' on the existing support surface

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:110)

76.14 Before replacing the existing mattress:

- evaluate the effectiveness of previous and current prevention and treatment plans
- set treatment goals consistent with the patient's goals, values, and lifestyle

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:110)

76.15 Consider using a high specification reactive foam mattress or non-powered pressure redistribution support surface for patients with Category/Stage I and II pressure ulcers.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:110)

76.16 Select a support surface that provides enhanced pressure redistribution, shear reduction, and microclimate control for patients with Category/Stage III and IV pressure ulcers. For all practical purposes, patients presenting with non-blanching redness or purple/maroon discolouration of intact skin should be provided with the same level of pressure redistribution as a Category/Stage II - IV pressure ulcer. Offloading and pressure redistribution may allow reperfusion of ischaemic and injured tissue, limiting the extent of infarcted or dead tissue.
HSE Recommendation Evidence Grade: D

Clinical Question 77: What factors should be considered when selecting seating support surfaces for the prevention and treatment of pressure ulcers?

Evidence Statement

The principles of pressure redistribution are based on the concept of distributing as much of the pressure (body weight) over as large a surface as possible (Moore and van Etten, 2011; Moore et al. 2014). Materials reduce tissue deformation by concepts known as immersion and envelopment (Dowsett and Newton, 2005; Moore and van Etten, 2011). Immersion enables the patient to sink into the material; if the material is too soft, the cushion will bottom out, if the cushion is too hard, there will be no immersion, resulting in the person balancing on the top of the cushion thereby increasing tissue deformation (Braden and Bergstrom, 1987). A cushion that is too thin will have insufficient material for the person to immerse into. Thus the deeper the cushion, the greater the immersion (Moore and van Etten, 2011; Moore et al., 2014). Envelopment is the ability of the material to encompass the contours of the human body, equalising pressure and reducing deformation (Dowsett and Newton, 2005; Moore and van Etten, 2011).

Recommendations

77.1 Individualise the selection and periodic reevaluation of a seating support surface and associated equipment for posture and pressure redistribution with consideration to:

- body size and configuration
- the effects of posture and deformity on pressure distribution
- mobility and lifestyle needs

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:112)

77.2 Select a stretchable/breathable cushion cover that fits loosely on the top surface of the cushion and is capable of conforming to the body contours.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:112)

77.3 Assess the cushion and cover for heat dissipation. Select a cushion and cover that permit air exchange to minimise temperature and moisture at the buttock interface.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:112)

77.4 Inspect and maintain all aspects of a seating support surface to ensure proper functioning and meeting of the patient's needs.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:112)

77.5 Provide complete and accurate training on use and maintenance of a seating support surface (including wheelchairs) and cushion devices delivered to the patient.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:112)

77.6 Refer patients to a specialist seating professional for evaluation if sitting is unavoidable.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:113)

77.7 Select a cushion that effectively redistributes the pressure away from the pressure ulcer.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:113)

77.8 Use alternating pressure seating devices judiciously for patients with existing pressure ulcers. Weigh the benefits of off-loading against the potential for instability and shear based on the construction and operation of the cushion.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:53)

Clinical Question 78: Are medical devices an important consideration in the risk assessment and prevention of pressure ulcers?

Evidence Statement

A medical device related (MDR) pressure ulcer is defined as a localised injury to the skin or underlying tissue as a result of sustained pressure from a medical device (NPUAP, 2016). In a study by Black et al. (2010) from a sample of 2178 hospitalised patients, the incidence of MDR was 34.5%; furthermore, patients with an MDR were 2.4 times more likely to develop a pressure ulcer. Skin assessment is fundamentally important in order to develop strategies to prevent the occurrence of MDR (Pittman et al., 2015).

Recommendations

78.1 Consider adults with medical devices to be at risk for pressure ulcers.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = B; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:117)

78.2 Consider children with medical devices to be at risk for pressure ulcers.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = B; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:118)

78.3 Review and select medical devices available in the facility based on the devices' ability to induce the least degree of damage from the forces of pressure and/or shear.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence = B; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:118)

78.4 Ensure that medical devices are correctly sized and fit appropriately to avoid excessive pressure.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:119)

78.5 Apply all medical devices following manufacturer's specifications.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:119)

78.6 Ensure that medical devices are sufficiently secured to prevent dislodgement without creating additional pressure.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:119)

78.7 Inspect the skin under and around medical devices at least twice daily for the signs of pressure related injury on the surrounding tissue.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:119)

78.8 Conduct more frequent (greater than twice daily) skin assessments at the skin-device interface in patients vulnerable to fluid shifts and/or exhibiting signs of localised or generalised oedema.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:119)

78.9 Classify medical device related pressure ulcers using the International NPUAP/EPUAP Pressure Ulcer Classification System (2009), with the exception of mucosal pressure ulcers.
HSE Recommendation Evidence Grade: D

78.10 Educate the patient with a medical device in the community setting and his/her caregivers to perform regular skin inspections.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:119)

78.11 Remove medical devices that are potential sources of pressure as soon as medically feasible.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:120)

78.12 Keep skin clean and dry under medical devices.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:120)

78.13 Exercise caution with the use of orthopaedic immobilisation devices (e.g. cast, braces and splints). If patient is at high risk of pressure damage, ensure skin inspection is facilitated as frequently as clinical condition allows.
HSE Recommendation Evidence Grade: D

78.14 Reposition the patient and/or the medical device to redistribute pressure and decrease shear forces.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:120)

78.15 Do not position the patient directly on a medical device unless it cannot be avoided.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:120)

78.16 Reposition the patient to redistribute pressure and shear forces created by the medical device.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:120)

78.17 Rotate or reposition medical devices when possible.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:120)

78.18 Provide support for medical devices as needed to decrease pressure and shear forces.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:120)

78.19 Consider using a prophylactic dressing for preventing medical device related pressure ulcers.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =B; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:120)

78.20 When selecting a prophylactic dressing consider:

- The ability of the dressing to manage moisture and microclimate, especially when used with a medical device that may be in contact with bodily fluids/drainage (e.g. percutaneous endoscopic gastrostomy tube)
- The ease of application and removal
- The ability to regularly assess skin condition
- The thickness of the dressing under tightly fitting devices
- The anatomical location of the medical device
- The type/purpose of the medical device

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:122)

3.6 Repositioning and Early Mobilisation

The following section addresses the importance of movement in the prevention of pressure ulcer development. This represents the K (keep moving) of the SSKIN bundle.

Clinical Question 79: Which patients should be repositioned to prevent the occurrence of pressure ulcers?

Evidence Statement

International best practice (NPUAP/EPUAP/PPPIA, 2014) advocates the use of repositioning as an integral component of a pressure ulcer prevention strategy as it is used to remove or redistribute pressure from a particular part of the body (Krapfl and Gray, 2008). Repositioning involves a change in position of the lying or seated patient with the purpose of relieving or redistributing pressure and enhancing comfort, undertaken at regular intervals (NPUAP/EPUAP/PPPIA, 2014). If the patient does not have the ability to reposition him/herself, assistance must be provided to support this activity of daily living (Moore and van Etten, 2014). The prevention of pressure ulcers involves a myriad of different interventions, including nutritional care (Stratton et al., 2005), pressure-reducing/relieving surfaces (McInnes et al., 2015), and skin and wound care (Helberg et al., 2006).

Recommendations

79.1 Reposition all patients at risk of, or with existing pressure ulcers, unless contraindicated.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =A; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:89)

Repositioning of an individual is undertaken to reduce the duration and magnitude of pressure over vulnerable areas of the body and to contribute to comfort, hygiene, dignity, and functional ability.

79.2 Consider the condition of the patient and the pressure redistribution support surface in use when deciding if repositioning should be implemented as a prevention strategy.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:90)

Regular positioning is not possible for some individuals because of their medical condition, so an alternative prevention strategy such as providing a high-specification mattress or bed may need to be considered.

Good Practice Point

Use of appropriate handling aids or equipment and safe handling technique to minimise friction and shear is essential during the repositioning process.

Clinical Question 80: What is the frequency at which patients with a pressure ulcer or at risk of pressure ulcer development should be repositioned?

Evidence Statement

When choosing a repositioning schedule, it is important to remember that cell death can occur as quickly as 2 to 4 hours (Loerakker et al., 2010). Numerous studies have explored the timing of repositioning and its impact on the incidence of pressure ulcer development (Young, 2004; Defloor et al., 2005; Vanderwee et al., 2007; Moore et al., 2011; Bergstrom et al., 2013). Two trials compared the 30º and 90º tilt positions using different repositioning frequencies (2-3 hourly, 3 hourly and 6 hourly) and three trials compared alternative repositioning frequencies (2, 3, 4 or 6 hourly). These trials had conflicting results in terms of pressure ulcer incidence, with some showing no statistical differences between the study groups (Young 2004; Vanderwee et al., 2007; Bergstrom et al., 2013). Conversely, others noted a statistically significant difference in pressure ulcer incidence among those turned every 3 hours versus 6 (Moore et al., 2011) or 4 hours on a visco-elastic foam mattress versus standard care (Defloor et al., 2005).

Recommendations

80.1 Reposition all individuals at risk of, or with existing pressure ulcers, unless contraindicated.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =A; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:89)

Repositioning of an individual is undertaken to reduce the duration and magnitude of pressure over vulnerable areas of the body and to contribute to comfort, hygiene, dignity, and functional ability.

80.2 Consider the condition of the individual and the pressure redistribution support surface in use when deciding if repositioning should be implemented as a prevention strategy.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:90)

Regular positioning is not possible for some individuals because of their medical condition, and an alternative prevention strategy such as providing a high-specification mattress or bed may need to be considered.

80.3 Consider the pressure redistribution support surface in use when determining the frequency of repositioning.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =A; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:90)

80.4 Determine repositioning frequency with consideration to the patient's:

- tissue tolerance
- level of activity and mobility
- general medical condition
- overall treatment objectives
- skin condition
- comfort

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:90)

80.5 Establish written pressure relief schedules that prescribe the frequency and duration of weight shifts.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:91)

80.6 Teach patients to do 'pressure relief lifts' or other pressure relieving manoeuvres as appropriate.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:91)

80.7 Regularly assess the patient's skin condition and general comfort. Reconsider the frequency and method of repositioning if the patient is not responding as expected to the repositioning regimen.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:91)

80.8 Increase activity as rapidly as tolerated.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:97)

Good Practice Point
Individuals on bed rest should progress to sitting and ambulation as rapidly as they can tolerate. Ambulation schedules may help offset the clinical deterioration often seen in individuals subject to prolonged bed rest.

Clinical Question 81: What techniques are recommended in the repositioning of patients with or at risk of developing a pressure ulcer?

Evidence Statement

International best practice advocates the use of repositioning as an integral component of a pressure ulcer management strategy (NPUAP/EPUAP/PPPIA, 2014). Patients who cannot reposition themselves require assistance. Pressure, from lying or sitting on a particular part of the body results in reduced oxygen and nutrient supply, impaired drainage of waste products and damage to cells (Oomens et al., 2015). If a patient with an existing pressure ulcer continues to lie or bear weight on the affected area, the tissues become depleted of blood flow and there is no oxygen or nutrient supply to the wound, and no removal of waste products from the wound, all of which are necessary for healing (Husain 1953; Kosiak 1966).

Recommendations

81.1 Reposition the patient in such a way that pressure is relieved or redistributed.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:91)

81.2 Avoid positioning the patient on bony prominences with existing non-blanchable erythema.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:91)

81.3 Avoid subjecting the skin to pressure and shear forces.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:91)

81.4 Use manual handling aids to reduce friction and shear. Lift, don't drag, the patient while repositioning.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:91)

81.5 Use a split leg sling mechanical lift when available to transfer a patient into a wheelchair or bedside chair when the patient needs total assistance to transfer. Remove the sling immediately after transfer.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:91)

81.6 Avoid positioning the patient directly onto medical devices such as tubes, drainage systems or other foreign objects.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:92)

81.7 Do not leave the patient on a bedpan longer than necessary.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:92)

Good Practice Point
The use of support surfaces does not replace the requirement for repositioning.

Clinical Question 82: What techniques should be used when repositioning a patient in bed?

Evidence Statement

The 30° tilted side-lying position is thought to be the most appropriate for the patient as there is less pressure applied to the bony prominences and therefore, blood supply to the weight-bearing area is not completely occluded (Sieler et al., 1986; Colin et al., 1996; Sachse et al., 1998; Defloor, 2000). The 30° tilt is a patient repositioning technique that can be achieved by rolling the patient 30° to a slightly tilted position with pillow support at the back. However, when using the 30° tilted position, check to see that the sacrum is off the bed. There is consensus that certain patient positions are not useful in terms of pressure ulcer prevention (Sieler et al., 1986; Colin et al., 1996; Sachse et al., 1998; Defloor, 2000). The 90° lateral position has been shown to decrease blood flow and trans-cutaneous oxygen tension to near anoxic levels and to increase interface pressures. The 90° lateral position should therefore be avoided (NPUAP/EPUAP/PPPIA, 2014). Obese patients may need to be turned to a higher angle (45°) in order to offload the sacrum.

Recommendations

82.1 Use the 30° tilted side-lying position (alternately, right side, back, left side) or the prone position if the patient can tolerate this and her/his medical condition allows.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:92)

82.2 Encourage patients who can reposition themselves to sleep in a 30° to 40° side-lying position or flat in bed if not contraindicated.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:92)

82.3 Avoid lying postures that increase pressure such as the 90° side-lying position, or the semi recumbent position.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:92)

82.4 Limit head-of-bed elevation to 30° for a patient on bed-rest unless contraindicated by medical condition or feeding and digestive considerations.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:93)

82.5 If sitting in bed is necessary, avoid head-of-bed elevation or a slouched position that places pressure and shear on the sacrum and coccyx.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:93)

Prone position

82.6 Use a pressure redistribution surface to offload pressure points on the face and body while in the prone position.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:93)

82.7 At each rotation, assess other body areas (i.e., breast region, knees, heels, toes, penis, clavicles, iliac crest, and symphysis pubis) that may be at risk when patients are in the prone position.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:93)

82.8 At each rotation, assess patients placed in the prone position for evidence of facial pressure ulcers.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:94)

Clinical Question 83: What techniques should be used when repositioning patients in a seated position?

Evidence Statement

Development and implementation of individualised prevention strategies should include consideration of the type of seat employed, the pressure redistributing surface in use and the type and frequency of repositioning (van Etten and Moore, 2011). Pressure may be redistributed through the use of chair tilting and self-positioning programmes (Defloor et al., 2005). If the patient can stand, pressure may be relieved at regular intervals in this way, although it is important to allow sufficient time during each standing episode (van Etten and Moore, 2011). Rest is fundamental to enhance cognitive performance (Moore et al., 2011); allowing the patient to rest in bed for periods throughout the day will relieve pressure and also reduce fatigue, thereby enhancing wellbeing.

Recommendations

83.1 Select a seated posture that is acceptable for the patient and minimises pressure and shear exerted on the skin and soft tissues.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:94)

83.2 Position the patient so as to maintain stability and his or her full range of activities.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:94)

83.3 Ensure that the feet are properly supported either directly on the floor, on a footstool, or on foot-rests when sitting (upright) in a bedside chair or wheelchair.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:94)

83.4 Limit the time a patient spends seated in a chair without pressure relief.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =B; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:95)

83.5 Provide adequate seat tilt to prevent sliding forward in the wheelchair or chair, and adjust footrests and armrests to maintain proper posture and pressure redistribution.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:94)

83.6 Avoid the use of elevating leg rests if the patient has inadequate hamstring length.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:95)

Clinical Question 84: What additional factors should be considered when repositioning a patient with an existing pressure ulcer?

Evidence Statement

Wound healing is a normal response to injury. It is initiated after the skin's integrity has been interrupted, for example, by the development of a pressure ulcer (Vanderwee et al., 2007). The purpose of the healing process is to replace the tissue that has been damaged with living tissue, and to restore the continuity of the skin (Young, 2004). Open wounds, including pressure ulcers, heal through formation of granulation tissue and epithelialisation (Bergstrom et al., 2013). Normal cellular metabolism requires an adequate supply of oxygen and nutrients, and also an effective elimination of waste metabolites (Loerakker et al., 2010). Sustained unrelieved pressure causes vascular obstruction that eliminates capillary blood flow to the skin (Loerakker et al., 2010), causing oxygen and nutrient deprivation (Husain, 1953). Since the cells necessary for wound healing cannot proliferate in such an environment, wound healing is impaired. Certain positioning techniques, for example, 90-degree lateral rotation, which is used during bed rest, may exacerbate this situation and cause complete anoxia to the weight-bearing area (Sieler et al., 1986; Colin et al., 1996; Sachse et al., 1998). Since the positioning of a patient directly onto a pressure ulcer is sometimes unavoidable, especially when multiple ulcers are present, the impact that this may have on wound healing is an important consideration.

Recommendations

84.1 Do not position a patient directly on a pressure ulcer.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:95)

84.2 Position the patient off areas of non-blanchable erythema or purple discolouration of intact skin. If pressure over the area cannot be relieved by repositioning select an appropriate support surface.
HSE Recommendation Evidence Grade: D

84.3 Inspect the skin for additional damage each time the patient is turned or repositioned. Do not turn the patient onto a body surface that is damaged or still reddened from a previous episode of pressure loading, especially if the area of redness does not blanch (i.e., Category/Stage I pressure ulcer).
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:96)

Good Practice Point

Continue to turn and reposition the patient regardless of the support surface in use. Establish turning frequency based on the characteristics of the support surface and the patient's response.

Clinical Question 85: What additional factors should be considered when repositioning a patient with an existing pressure ulcer in a chair?

Evidence Statement

Normal cellular metabolism requires an adequate supply of oxygen and nutrients, and also an effective elimination of waste metabolites (Husain, 1953). If the pressure ulcer exists over a weight-bearing area whilst seated, the pressure and shear forces the patient is exposed to continue to cause cell deformation and impaired lymphatic drainage, resulting in oxygen and nutrient deprivation to the affected area (Oomens et al., 2015) and wound healing potential is severely impeded. It is fundamental that the potential for wound healing is maximised for patients with existing pressure ulcers (Oomens et al., 2015). For this to occur the wound requires an adequate blood supply, since the metabolic need of the wounded area is great (Husain, 1953).

Recommendations

85.1 Minimise seating time and consult a seating specialist for those with existing pressure ulcers and if pressure ulcers worsen, on the seating surface selected.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:96)

85.2 If sitting in a chair is necessary for patients with pressure ulcers on the sacrum/coccyx or ischia, **limit sitting to three times a day for periods of sixty minutes or less**. Consult a seating specialist to prescribe an appropriate seating surface and/or positioning techniques to avoid or minimise pressure on the ulcer.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:96)

85.3 Weigh the risks and benefits of supported sitting against benefits to both physical and emotional health.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:96)

85.4 Avoid seating a patient with an ischial ulcer in a fully erect posture (in chair or bed).
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:96)

85.5 Modify sitting time schedules and reevaluate the seating surface and the patient's posture if the ulcer worsens or fails to improve.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:96)

Good Practice Point

Do not use ring or donut-shaped devices for positioning patients with a pressure ulcer or those at risk of pressure ulcer development.

85.6 Develop a schedule for progressive sitting according to the patient's tolerance and pressure ulcer response.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =☝(NPUAP/EPUAP/PPPIA 2014:97)

Good Practice Point

Caution should be exercised when treating patients with impaired sensation, as they may be unaware of the discomfort of initial cell damage, which could potentially worsen pressure ulcer damage.

3.7 Repositioning Documentation

Clinical Question 86: What criteria should be noted in the documentation of repositioning regimens?

Evidence Statement

Documentation is a fundamental component of clinical practice, with the quality of documentation considered to be an indicator of the quality of care delivered (HSE, 2011). Documentation of repositioning practice within the patient's clinical notes provides evidence that repositioning has occurred (Moore et al., 2011). Furthermore, inclusion of the assessment of outcomes of the repositioning plan also provides the evidence for continuation or alteration of the care plan (Moore et al., 2011). The importance of this is multi-fold; to ensure the provision of safe clinical care for the patient, to act as a means of communication between team members, and to fulfil the legal and ethical responsibilities of staff (Colin et al., 1999). This is the only means by which the clinician provides evidence that care has been planned, implemented and outcomes assessed.

Recommendation

86.1 Record repositioning regimens, specifying frequency and position adopted and include an evaluation of the outcome of the repositioning regimen.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍*(NPUAP/EPUAP/PPPIA 2014:98)*

Good Practice Point

Clinicians should be aware of their professional accountability and legal obligations in the provision of clinical care and documentation of same.

3.8 Repositioning to Prevent and Treat Heel Pressure Ulcers

Clinical Question 87: What measures should be employed to prevent heel pressure ulcers?

Evidence Statement

Prevalence and incidence studies demonstrate that, after the sacrum, the heel is the most common site for a pressure ulcer to develop (Defloor, 2000). The unique anatomical structure of the heel relating to its posterior prominence and lack of padding over the calcaneus means that the concept of pressure being equal to force divided by area, becomes increasingly important (Moore and van Etten, 2011). As the heel is a relatively small area then the same force applied to the heel, when compared to other parts of the body, such as the sacrum, means that the heel is much more likely to be adversely affected by pressure and shear forces (Moore and van Etten, 2011). Owing to the devastating consequences that can arise from heel pressure ulcers, such as amputation or even death, prevention of these wounds is of paramount importance.

For the treatment of heel pressure ulcers see section 2 on diabetic foot ulcers.

Recommendations

87.1 Inspect the skin of the heels regularly.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:100)

87.2 When repositioning for preventing heel pressure ulcers, ensure that the heels are free of the surface of the bed.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:100)

87.3 The knee should be in slight (5° to 10°) flexion.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:101)

There is indirect evidence that hyperextension of the knee may cause obstruction of the popliteal vein, and this could predispose an individual to deep vein thrombosis (DVT).

87.4 Avoid areas of high pressure, especially under the Achilles tendon.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:101)

87.5 Use a foam cushion under the full length of the calves to elevate heels.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =B; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:101)

87.6 Use heel suspension devices that elevate and offload the heel completely in such a way as to distribute the weight of the leg along the calf without placing pressure on the Achilles tendon.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =B; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:100)

87.7 Apply heel suspension devices according to the manufacturer's instructions.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:101)

87.8 Remove the heel suspension device every 6-8 hours to assess skin integrity.
HSE Recommendation Evidence Grade: D

87.9 Relieve pressure under the heel(s) with Category/Stage I or II pressure ulcers by placing legs on a pillow to 'float the heels' off the bed or by using heel suspension devices.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =B; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:101)

87.10 For Category/Stage III and IV pressure ulcers, place the leg in a device that elevates the heel from the surface of the bed, completely offloading the pressure ulcer. Consider a device that also prevents foot drop.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014: 102)

Good Practice Point

The following **should not** be used to elevate heels:

- synthetic sheepskin pads
- cut-out, ring, or doughnut-type devices
- intravenous fluid bags
- water-filled gloves

3.9 The Role of Incontinence in the Prevention and Management of Pressure Ulcers

The following section addresses the importance of incontinence management in pressure ulcer development. This represents the "I" (incontinence) of the SSKIN bundle.

Clinical Question 88: What is the role of incontinence management in the prevention and management of pressure ulcers?

Evidence Statement

This question was addressed using two systematic reviews and a meta-analysis (Beeckman et al., 2016). Fifty-eight trials were included; the authors examined tested skin care products, procedures and frequency of use. Very limited evidence exists on the effects of interventions for preventing and treating incontinence associated dermatitis (IAD) in adults. The association found in these systematic reviews implies that IAD, incontinence and moisture should be key considerations in the risk assessment of pressure ulcers. A recent meta-analysis demonstrated high predictive capacity of the risk assessment scales that include incontinence/moisture and recommended that PU risk assessment should not be based solely on clinical judgment due to its poor predictive ability (Garcia-Fernandez et al., 2014).

Recommendations

88.1 In patients at risk of both incontinence associated dermatitis (IAD) and pressure ulcer, an individualised prevention plan should be implemented, including repositioning and use of pressure redistributing devices.
HSE Recommendation Evidence Grade: A

88.2 For the prevention of IAD, conduct structured perineal skin care, including gentle cleansing with a product that has a balanced pH and use of a skin protectant following each major incontinence episode, or skin protectants that do not require application after every incontinence episode.
HSE Recommendation Evidence Grade: A

3.10 Prevention and Management of Moisture-Associated Skin Damage

Skin damage as a result of moisture was traditionally considered to be a continence-related problem (Defloor, 1999; Gray et al., 2007; Dowsett and Allan, 2013). However, limited research and clinician experience has identified a range of conditions where exposure to moisture has increased susceptibly to skin damage. Moisture-associated skin damage (MASD), an over-arching term to describe these conditions, is a relatively recent concept in skin and wound care literature. Identifying moisture as a new aetiological factor that may contribute to chronic inflammation, erosion and skin breakdown is important (Black et al., 2011; Colwell et al., 2011; Gray et al., 2012; Beeckman et al., 2015a). MASD can be defined as:

"inflammation and erosion of the skin caused by prolonged exposure to various sources of moisture, including urine or stool, perspiration, wound exudate, mucus or saliva, and their contents…..characterized by inflammation of the skin occurring with or without erosion or secondary cutaneous infection."(Gray et al., 2011, p233)

While it is acknowledged that multiple disorders can result in maceration, oedema, inflammation, wrinkling, water-logging and excoriation of the skin (Dowsett and Allan, 2013), the four most common types of MASD are:

- incontinence-associated dermatitis (IAD)
- peri-wound moisture-associated dermatitis
- peri-stomal moisture-associated dermatitis
- inter-triginious dermatitis

Moisture as an individual element, is unlikely to contribute to significant skin damage, but when combined with chemical factors (e.g. irritants within the moisture source), the pH of the moisture source, mechanical factors (e.g. friction and shear) and pathogenic microorganisms, it could potentiate more serious skin damage (Black et al., 2011, Colwell et al., 2011; Gray et al., 2011). As an evolving area of clinical research, it is imperative that clinicians remain conscious of the contemporaneous evidence base relating to MASD.

Good Practice Point

Clinicians must be alert to the differentiation between moisture-associated skin damage and other wound aetiologies, particularly pressure ulcers.

Clinical Question 89: What additional factors do clinicians need to consider when examining the skin for moisture-associated skin damage?

Evidence summary

The evidence to support these recommendations is largely based on limited available research along with the clinical expertise of a collaboration of clinicians who developed a consensus and provide recommendations for the prevention and management of moisture-associated skin damage (MASD) (Black et al., 2011; Colwell et al., 2011; Beeckman et al., 2015a).

Moisture sources normally produced within the body regularly come into contact with the skin without causing harm. However, contact with excessive moisture over a prolonged period, compounded by irritant substances, chemicals and micro-organisms and associated mechanical factors, can lead to MASD (Dowsett and Allan, 2013).

Inter-triginous dermatitis, incontinence-associated dermatitis (IAD), peri-wound moisture associated dermatitis and peri-stomal moisture associated dermatitis are the most recognised forms of MASD (Black et al., 2011; Colwell et al., 2011; Gray et al., 2011; Beeckman et al., 2015a).

The Scottish Excoriation and Moisture Related Skin Damage Tool (appendix VIII) may assist clinicians in identifying causes of moisture associated skin damage.

Recommendations

89.1 All clinicians should identify and document the source of moisture – perspiration, wound exudate, urinary or faecal ostomy effluent, urine, stool or combined urine and stool or other.
HSE Recommendation Evidence Grade: D

89.2 All clinicians should identify and document additional potential contributory factors – pH, chemical, mechanical, potential microorganisms in moisture source.
HSE Recommendation Evidence Grade: D

89.3 All clinicians should be aware of the duration of exposure, volume and consistency of the moisture source.
HSE Recommendation Evidence Grade: D

89.4 Clinicians should document skin reaction to moisture source and associated factors such as inflammation, erythema, maceration, denudation, erosion and signs of infection.
HSE Recommendation Evidence Grade: D

89.5 Clinicians should determine skin care products, incontinence absorption devices, dressing and stoma care products in use at the time of assessment.
HSE Recommendation Evidence Grade: D

Clinical Question 90: How can the clinician prevent and manage moisture-associated skin damage?

Evidence Statement

The evidence to support these recommendations is largely based on limited available research along with the clinical expertise and experience of a group of clinicians who collaborated to develop a consensus panel to review the contemporaneous knowledge base and provide recommendations for the prevention and management of MASD (Colwell et al., 2011; Beeckman et al., 2015a). Further recommendations have been made following the proceedings from the Global Incontinence-Associated Dermatitis (IAD) Panel (Beeckman et al., 2015b).

Prevention and management of MASD involves a multimodal approach that must be consistently applied. The first step should involve elimination of the moisture source if possible or where not possible, reducing the potential negative effects. An interventional skin care regimen (cleanse, protect and restore moisture) which removes irritants, maximises barrier function and protects from exposure to irritants is essential in both prevention and management. Where possible, use devices that divert the moisture sources away from at risk and affected skin. The potential for cutaneous infection is high so maintaining vigilance at each assessment is vital (Colwell et al., 2011; Beeckman et al., 2015a).

Recommendations

90.1 Clinicians need to maintain vigilance in maintaining optimum skin condition.
HSE Recommendation Evidence Grade: D

90.2 Clinicians should treat and remove the cause of the moisture source and where this is not possible limit the contact time of the moisture source with the skin.
HSE Recommendation Evidence Grade: D

90.3 Clinicians should identify additional potential contributory factors of MASD (mechanical, chemical, pH, micro-organisms) and reduce/remove these factors where possible.
HSE Recommendation Evidence Grade: D

90.4 Clinicians should be able to recognise and manage minor cases of MASD prior to progression and skin breakdown.
HSE Recommendation Evidence Grade: D

90.5 Clinicians should employ a skin care regimen that is consistently employed to remove irritants from the skin (cleanse); protect from exposure to irritant substances (protect) and maximise the intrinsic moisture barrier function of the skin (restore).
HSE Recommendation Evidence Grade: D

90.6 Clinicians should be vigilant to potential cutaneous infection and implement the appropriate antimicrobial treatment if cutaneous infection is present.
HSE Recommendation Evidence Grade: D

3.11 The Role of Nutrition in the Prevention and Management of Pressure Ulcers

The following section addresses the role of nutrition pressure ulcer development, which represents “N” (nutrition) in the SSKIN bundle.

Good nutritional status is essential for management of pressure ulcers (Leaper and Harding, 1998) and is generally accepted as an essential part of care rather than a specific factor influencing outcome (Cereda, 2017). Specific nutritional guidelines for prevention and treatment of pressure ulcers have been published (NICE, 2014;NPUAP/EPUAP/PPPIA, 2014).

Recommendations in clinical questions 91 and 92 graded ‘C’ draw on NICE guidance:

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Clinical Question 91: Is nutritional status an important consideration in the prevention of pressure ulcers?

Evidence Statement

There is evidence that nutritional status influences pressure ulcer incidence and prevalence. Both undernutrition i.e. malnutrition (Stratton et al., 2005; Thomas 2007) and overnutrition i.e. obesity have been positively associated with the incidence of pressure ulcers (Schoonhoven, 2006; Drake et al., 2010; Hyun et al., 2014).

The role of malnutrition in pressure ulcer pathophysiology is multi-factorial and thought to be due to reduced nutrient availability for tissue maintenance and repair (Leaper and Harding, 1999; Stratton et al., 2005). Malnutrition results in muscle atrophy and reduction in soft tissue area, increasing bony prominences (Stratton et al., 2005). Deep wounds tend to present over bony prominences (Oomens et al., 2015). Malnutrition may also result in physical weakness, decreased mobility and oedema as well as mental apathy, reducing the patient's capacity to reposition themselves (Stratton et al., 2005; Oomens et al., 2015).

The role of obesity in pressure ulcer development can also be associated with malnutrition (see Clinical Question 21) as well as decreased mobility and subsequent pressure on skin surfaces (Drake et al., 2010; Hyun et al., 2014). Recent meta-analysis found that the evidence relating to the use of oral nutritional supplements for the prevention of pressure ulcer development was inconclusive due to a paucity of well-designed studies (Langer et al., 2014).

Recommendations:

91.1 Screen nutritional status for each individual at risk or with a pressure ulcer:

- At admission to a health care setting
- With each significant change of clinical condition and/or
- When progress toward pressure ulcer closure is not observed

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:78)

91.2 Use a valid and reliable nutrition screening tool to determine nutritional risk.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:78)

91.3 If patients are identified at risk of developing a pressure ulcer and or are identified as been at risk of malnutrition they should be referred for a nutritional assessment by a registered dietian to ensure adequacy of intake.
HSE Recommendation Evidence Grade: A

91.4 Offer adults with a pressure ulcer a nutritional assessment by a dietitian or other health care professional with the necessary skills and competencies.
HSE Recommendation Evidence Grade: C

See **Clinical Question 19** for more detail on nutrition screening.

91.5 There is insufficient evidence at this time to recommend routine prescribing of oral nutritional supplements for all patient groups for the prevention of pressure ulcer development in the absence of proven nutritional deficiency.
HSE Recommendation Evidence Grade: A

Clinical Question 92: Is nutritional status an important consideration in the treatment of pressure ulcers?

Evidence Statement

All phases of pressure ulcer healing place a demand on the body's reserves of energy and nutrients, particularly protein (Sernekos, 2013). An adequate protein intake is necessary for positive nitrogen balance (Stechmiller, 2010). It is essential that an adequate energy intake is consumed primarily from carbohydrate and fat to avoid protein been used in this process. A recent systematic review and meta-analysis (Cereda, 2011) confirmed that patients with pressure ulcers have a significantly higher resting energy expenditure than patients without pressure ulcers.

Evidence suggests that protein requirements are higher and that increased protein intakes have improved pressure ulcer healing rates. (Stratton 2005; Lee, 2006; Cereda, 2015). Insufficient protein intakes results in decreased skin and fascial wound breaking strength and increased infection rates (Stechmiller, 2010). Sufficient protein intake is required to produce adequate granulation tissue, which is necessary to replace damaged tissue. Severe pressure ulcers for example grade 3 and 4 are cavity wounds with large amounts of tissue destruction (Defloor, 2004). The loss of protein from pressure ulcer exudate will impact on the rate of healing and will affect metabolic demand for protein. Therefore, if exudate losses are high, protein requirements will be increased.

Given the positive effect of protein on the healing of pressure ulcers, the role of specific amino acids namely arginine, has been investigated. Whilst there is no conclusive evidence supporting an independent effect of arginine on healing, there is ongoing emerging evidence that it can significantly improve rate of pressure ulcer healing when used as a part of an enriched nutrient formula (Cereda, 2009; Cereda, 2015; Cereda, 2017). Despite this evidence to provide a high calorie, high protein, arginine and micronutrient enriched formula in certain patient types (Cereda, 2015; Cereda, 2017), further studies are required before a blanket recommendation for this specific oral nutrition supplement formula rather than 'high protein' oral nutritional supplements can be made for all patients with pressure ulcers (Neyens et al., 2017; Oliveria et al., 2017)

Many studies have also investigated varying levels of micronutrient supplementation in patients with pressure ulcers, but to date there is no conclusive evidence to support intakes above the recommended daily allowance (Thomas, 2014).

Due to the paucity of good quality clinical trials and outcomes data assessing the effects of nutritional therapy on pressure ulcer the optimal nutrition care plan to enhance pressure ulcer healing remains unknown.

Recommendations

92.1 Provide individualised energy intake based on underlying medical condition and level of activity.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =B; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:80)

92.2 Provide 30-35 kcalories/kg body weight for adults with a pressure ulcer who are assessed as being at risk of malnutrition.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =B; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:80)

92.3 Offer 1.25-1.5grams protein/kg body weight for adults with an existing pressure ulcer who are assessed to be at risk of malnutrition when compatible with goals of care, and reassess as condition changes.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =B; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:82)

92.4 Assess renal function to ensure that high levels of protein are appropriate for the individual.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:82)

92.5 Offer fortified foods and/or high calorie, high protein oral nutritional supplements between meals if nutritional requirements cannot be achieved by dietary intake.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =B; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:81)

92.6 Consider using a supplement that contains high protein, arginine and micronutrients for adults who are malnourished with a pressure ulcer Category/Stage III or IV or multiple ulcers for at least 8 weeks.

HSE Recommendation Evidence Grade: A

92.7 Arginine enriched supplements or formulae are not recommended for severely septic patients in the ICU setting.

HSE Recommendation Evidence Grade: C

92.8 Prescribers should refer to any local and national guidance on indications for prescribing oral nutritional supplements

HSE Recommendation Evidence Grade: D

92.9 Provide and encourage adequate daily fluid intake for hydration for an individual assessed to be at risk of or with a pressure ulcer. This must be consistent with the individual's comorbid conditions and goals.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:84)

92.10 Provide/encourage an individual with a pressure ulcer to consume a balanced diet that includes good sources of vitamins and minerals.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =B; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:85)

92.11 Provide/encourage an individual with a pressure ulcer to take vitamin and mineral supplements when dietary intake is poor or deficiencies are confirmed or suspected.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =B; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:85)

92.12 Do not offer nutritional supplements to treat a pressure ulcer in adults whose nutritional intake is adequate.
HSE Recommendation Evidence Grade: C

**Refer to the section 1.8 on nutrition for comprehensive guidance*

Good Practice Point
Adequate nutrition is essential to manage pressure ulcers with individualised dietary prescription based on thorough nutrition assessment.

3.12 Special Populations

3.12.1 Care of the Older Person with or at risk of developing a pressure ulcer

Clinical Question 93: What special considerations should the clinician be aware of when assessing an older person with a pressure ulcer or at risk of pressure ulcer development?

Evidence Statement

All care plans for pressure ulcer prevention should reflect the principals of the SSKIN bundle (refer to *appendix XI*) In addition to these, there are special considerations outlined below, which the clinician should be cognisant of when assessing and treating older adults.

As age increases so too does the risk of pressure development. Furthermore the risk of mortality from a pressure ulcer increases with age (Slavin, 1996). For instance, in one study, 80% of those who died with a pressure ulcer were over the age of 75 years (Slavin, 1996). In younger hospitalised patients (<65 years of age) with the principal diagnosis of a pressure ulcer, the mortality rate is <0.1% whereas, in older hospitalised patients it increases up to 10% as age increases correspondingly (Moore and Cowman, 2015). These findings are also reflected in the community setting where research has found that older patients with pressure ulcers living in the community were more likely to die when compared to their counterparts without pressure ulcers (Iocono et al., 1998). Therefore, greater focus on enhancing PU prevention strategies will reduce the significant mortality associated with this health care problem particularly given that global mortality directly attributable to PUs has increased by 32.7% between the years 2000-2010 (Braden and Bergstrom, 1987).

Recommendations

93.1 Consider the patient's cognitive status when conducting a comprehensive assessment and developing a pressure ulcer prevention and/or treatment plan.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:212)

93.2 Incorporate the patient's cognitive ability into the selection of a pain assessment tool.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:212)

93.3 Ensure pressure ulcers are correctly differentiated from other skin injuries, particularly incontinence-associated dermatitis or skin tears.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:212)

Refer to section 3.10 on MASD for further details.

93.4 Set treatment goals consistent with the values and goals of the patient.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:212)

93.5 Engage the family or legal guardian when establishing goals of care and validate their understanding of these goals.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:212)

93.6 Educate the patient and his or her significant others regarding skin changes in ageing and at end of life.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:213)

Clinical Question 94: What special considerations should the clinician be aware of when treating an older person with a pressure ulcer or at risk of pressure ulcer development?

Evidence Statement

The association between age and pressure ulcer development is of importance as demographic forecasts suggest that in the next 50 years there will be a three-fold global increase in older persons (van Etten, 2014). It is estimated that by 2050, older patients will comprise almost 17% of the global population compared to 7% in 2002 (van Etten, 2014). The older population is at greater risk of pressure ulcer development due to the likelihood of underlying neurological and cardiovascular problems (Oomens et al., 2014). Furthermore, as a consequence of ageing, the skin undergoes a number of pathological changes (Dimond, 2003). The elastin and collagen content of the skin changes, reducing its elasticity and resilience which in turn lowers the skin's protective mechanism against the adverse effects of shear and friction forces (Quan and Fisher, 2015). A number of studies have identified the statistically significant relationship between PU development and older age (Dowsett and Newton, 2005; O'Callaghan et al., 2007; Mc Cluskey and Mc Carthy, 2012; Moore et al., 2013b). Furthermore, in one study the probability of a 60-year-old patient in long-term-care, acquiring a pressure ulcer was 17%; however, for a 90 year old, in a similar health care setting, the probability rose to 43% (Dowsett and Newton, 2005). Similarly, among hospitalised patients, those >80 years of age are seven times more likely to develop PUs when compared to those aged <45 years (Mc Cluskey and Mc Carthy, 2012). Given the fact that 72% of all PU's occur in the over 65 year age group (Defloor and Grypdonck, 2004) a greater focus on providing enhanced prevention strategies will significantly advance the drive for healthy ageing among this population.

Refer to clinical question 81 for further guidance on repositioning.

Recommendations

94.1 Protect aged skin from skin injury associated with pressure and shear forces.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:213)

94.2 Use a barrier product to protect aged skin from exposure to excessive moisture in order to reduce the risk of pressure damage.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:213)

94.3 Select atraumatic wound dressings to prevent and treat pressure ulcers in order to reduce further injury to frail older skin.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:213)

Please adhere to local guidance when selecting wound dressings.

94.4 Develop and implement an individualised continence management plan.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:213)

94.5 Regularly reposition the older adult who is unable to reposition independently.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =A; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:214)

94.6 Consider the condition of the patient and the pressure redistribution support surface in use when deciding if repositioning should be implemented as a prevention strategy.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:214)

94.7 Exercise caution in position selection and manual handling technique when repositioning the older adult
*NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:214**)***

94.8 Frequently reposition the head of older adults who are sedated, ventilated or immobile.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:215)

94.9 Consider older adults with medical devices to be at risk for pressure ulcers.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:215)

94.10 Ensure that medical devices and orthopaedic immobilisation devices such as plaster of Paris are correctly sized and fit appropriately to avoid excessive pressure/shear.
HSE Recommendation Evidence Grade: D

Caution: Diabetes, PAD, swelling and weight fluctuation.

94.11 Prior to application of the above, a risk assessment should be undertaken to determine the patient's suitability.
HSE Recommendation Evidence Grade: D

94.12 Consider using a prophylactic dressing for preventing medical device related pressure ulcers.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:215)

Please adhere to local guidance when selecting wound dressings.

3.12.2 Care of the child with or at risk of developing a pressure ulcer

Clinical Question 95: What special considerations should the clinician be aware of when assessing a child with a pressure ulcer or at risk of pressure ulcer development?

Evidence Statement

The assessment of pressure ulcer risk across the ages and developmental stages of children is challenging. Children have distinctive anatomical and physiological factors which influence their risk of developing a pressure ulcer and which change as children grow and develop. For example, the head is proportionately larger and heavier in infants and young children than in older children and adults, and this coupled with friction and shear in children who may have limited mobility due to their age or medical status, increases the risk of occipital pressure ulcers (Manning et al., 2015). Children's bodies contain a proportionately higher volume of water than adults, and fluid and electrolyte imbalance can develop more rapidly, particularly in infants and young children (McCance and Huether, 2015). Furthermore, the higher water content along with the metabolic demands associated with infection and pyrexia in children increase the risk of dehydration, which in turn increases the skin's susceptibility to pressure related damage. As children grow and develop, devices such as wheelchairs, orthotics, splints and prostheses may become ill-fitting and cause tissue damage (Baharestani, 2007). Clinicians must be aware of the importance of regular evaluation and sizing of all such devices.

Children who are at greatest risk of developing a pressure ulcer are those who are aged under 1 year, are in the Paediatric Intensive Care Unit, have a medical device, and have a critical, chronic or life-limiting illness (Kottner et al., 2010; Schluer et al., 2012;Schluer et al., 2014; Manning et al., 2015). Medical devices are associated with 50% of pressure ulcers in children (Willock et al., 2005).

Pressure ulcer risk assessment scales have been developed and validated for use with children, for example, the Braden Q Scale (Curley et al., 2003) and the Glamorgan Scale (Willock et al., 2005). A systematic review of the impact of pressure risk assessment scales for use with children found that robust evidence about the performance of the scales is lacking and that no one scale could be identified as being superior to others (Kottner et al., 2013). The National Institute for Health and Care Excellence (2014c) recommended the use of a validated tool to support clinical judgement, and it is important that the scale chosen is an adjunct to, and not a replacement of, clinicians' assessment.

Please refer to clinical question 15 for guidance on the assessment of pain in children.

Recommendations

95.1 Consider the child's developmental and cognitive stage when conducting a comprehensive assessment and developing a pressure ulcer prevention and/or treatment plan.
HSE Recommendation Evidence Grade:D

95.2 Use a scale validated for this population to support clinical judgement.
HSE Recommendation Evidence Grade: D

95.3 Clinicians must be aware of specific sites (for example, the occipital area) where children are at risk of developing a pressure ulcer.
HSE Recommendation Evidence Grade: D

95.4 Regular wheelchair assessments and pressure relief or redistribution should be offered to children who are long-term wheelchair users.
HSE Recommendation Evidence Grade: D

95.5 Clinicians should regularly reassess and measure splints, orthotics, garments, prosthesis and other medical devices, to ensure they fit correctly as children grow and develop.
HSE Recommendation Evidence Grade: D

Clinical Question 96: What special considerations should the clinician be aware of when caring for a child with or at risk of a pressure ulcer?

Evidence Statement

The evidence to support these recommendations is largely drawn from the NICE clinical guidelines on Pressure Ulcers: Prevention and Management (NICE, 2014c). The association between the extent and impact of children's medical condition and their risk of developing a pressure ulcer is of importance as children's healthcare services are increasingly seeing children with chronic conditions, complex care needs and multiple comorbidities. Internationally, the greatest increase in demand for children's hospital services is seen in children with a significant chronic condition (Berry et al., 2013). Increasing medical complexity in children is associated with an increased likelihood of inpatient admission and Paediatric Intensive Care Unit admission (O'Mahony et al., 2013). It is difficult to measure the extent of the problem of pressure ulcers in children with complex care needs, as definitions of medical complexity vary, and prevalence studies generally do not provide sufficiently detailed descriptors of children's complexity (Freundlich, 2017).

Recommendations in questions 96 and 97 graded 'C' draw on NICE guidance:

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Recommendations

96.1 Protect children's skin from skin injury associated with pressure and shear forces.
HSE Recommendation Evidence Grade: C

96.2 Ensure that children who are at risk of developing a pressure ulcer are repositioned at least every 4 hours.
HSE Recommendation Evidence Grade: D

96.3 Consider more frequent repositioning than every 4 hours for children who have been assessed as being at high risk of developing a pressure ulcer, for example due to their clinical condition or impaired mobility and activity. Document the frequency of repositioning required.
HSE Recommendation Evidence Grade: C

96.4 Relieve pressure on the scalp and head when repositioning children at risk of developing a pressure ulcer.
HSE Recommendation Evidence Grade: D

96.5 Clinicians should assess and evaluate the need for medical devices and where possible, remove these as soon as they are no longer clinically required.
HSE Recommendation Evidence Grade: D

96.6 Clinicians should regularly reassess and measure splints, orthotics, garments, prosthesis and other medical devices, to ensure they fit correctly as children grow and develop.
HSE Recommendation Evidence Grade: D

96.7 Do not offer skin massage or rubbing to children to prevent a pressure ulcer.
HSE Recommendation Evidence Grade: C

96.8 Use a high-specification foam cot, bed mattress or overlay for all infants and children who have been assessed as being at high risk of developing a pressure ulcer, for example due to their clinical condition or impaired mobility and activity.
HSE Recommendation Evidence Grade: D

96.9 Use barrier preparations to help prevent skin damage such as moisture lesions, for children who are incontinent.
HSE Recommendation Evidence Grade: C

96.10 Consider dressing products which are atraumatic on removal and consider alternative means of securing dressings, for example, tubular retention bandages, to prevent further skin damage.
HSE Recommendation Evidence Grade: D

96.11 Educate the parents/guardians and the child if developmentally and cognitively appropriate, about the causes and early signs of pressure ulcer development and pressure ulcer prevention.
HSE Recommendation Evidence Grade: D

96.12 Provide the parents/guardians with written information to support the verbal explanations and education.
HSE Recommendation Evidence Grade: D

96.13 Provide children with developmentally appropriate written and pictorial information to support the verbal explanations and education.
HSE Recommendation Evidence Grade: D

Clinical Question 97: Is nutritional status an important consideration in the prevention and management of pressure ulcers in children?

Evidence Statement

Nutritional status is an important consideration for all children. A study by Willock (2009) states the Glamorgan risk assessment scale has 11 statistically significant paediatric pressure ulcer risk factors: the majority of which are related to nutritional status. These include;

- significant anaemia
- persistent pyrexia (temperature > 37.5C for more than 12 hours)
- poor peripheral perfusion
- inadequate nutrition (unable to take/not absorbing oral or enteral feeds and not supplemented with hyper alimentation)
- low serum albumin level (<3.5 g/dL)
- weight < 10th percentile
- incontinence (if inappropriate for age)
- inability to move without great difficulty or deterioration in condition or having prolonged surgery
- inability to change position without assistance/inability to control body movement some mobility, but reduced for age equipment/objects/hard surface pressing or rubbing on skin

To ensure children with wounds are meeting their nutritional requirements, NICE and NPUAP/EPUAP/PPPIA (2014) guidelines should be followed in paediatric patients (Baharestani, 2007; NPUAP/EPUAP/PPPIA 2014; Wounds UK 2014; NICE 2014). As data in the literature on prevention and treatment of pressure ulcers is scant for paediatric patients, guidance and recommendations on nutritional treatment of children (Shaw, 2015) as well as overview of pressure ulcer healing in chronically ill children by Rodriguez- Key and Alonzi (2007) were also used in developing recommendations.

Recommendations

97.1 Conduct an age appropriate assessment for neonates and children.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:233)

97.2 Regularly reassess the nutritional requirements of critically ill neonates and children who have or are at risk of a pressure ulcer.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:233)

97.3 Nutritional assessment should be performed by a paediatric dietitian or other healthcare professional with the necessary skills and competencies.
HSE Recommendation Evidence Grade: C

97.4 Develop an individualised nutrition care plan for neonates and children with, or at risk of, a pressure ulcer.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:233)

97.5 Ensure all neonates and children maintain adequate hydration.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:233)

97.6 When oral intake is inadequate, consider age appropriate nutritional supplements for neonates and children who are at risk of a pressure ulcer and are identified as being at risk of malnutrition.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:233)

97.7 When oral intake is inadequate, consider age appropriate nutritional supplements for neonates and children who have an existing pressure ulcer and are identified as being at risk of malnutrition.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:233)

97.8 When oral intake is inadequate, consider enteral or parenteral nutritional support in neonates and children who are at risk of a pressure ulcer or have an existing pressure ulcer and who are also identified as being at risk of malnutrition.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:233)

97.9 Do not offer nutritional supplements specifically to prevent a pressure ulcer in children with adequate nutritional status for their developmental stage and clinical condition.
HSE Recommendation Evidence Grade: C

97.10 Do not offer subcutaneous or intravenous fluids specifically to prevent a pressure ulcer in children with adequate hydration status for their development stage and clinical condition.
HSE Recommendation Evidence Grade: C

97.11 Supplementation with vitamins and minerals should be considered based on biochemical indices and the overall clinical picture.
HSE Recommendation Evidence Grade: D

3.12.3 Care of Patients with a Spinal Cord Injury With or At Risk of Developing a Pressure Ulcer

Clinical Question 98: What special considerations should the clinician be aware of when treating patients with a spinal cord injury and a pressure ulcer, or at risk of pressure ulcer development?

Evidence Statement

Pressure ulcers and their treatment represent one of the most challenging clinical problems faced by patients who have spinal cord injury (SCI) (Kruger et al., 2013). Despite the advances in spinal surgery and rehabilitation the morbidity and mortality associated with SCI is significant (Zakrasek, Creasey and Crew 2015). The sensory loss, motor impairment and skin changes of SCI increase the vulnerability of this patient cohort to PU development and heighten their risk for recurrent ulcers.

The Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline (EPUAP/ NPUAP/PPPIA, 2014) informed this section. This section of the guideline includes recommendations specific to, or of particular relevance for individuals with SCI. Other aspects of PU prevention and management are addressed in other sections of the document.

Recommendations

98.1 Transfer the individual off a spinal hardboard/backboard as soon as feasible after admission to an acute care facility in consultation with a qualified clinician.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:236)

98.2 Replace an extrication cervical collar with an acute care rigid collar as soon as feasible in consultation with a qualified clinician.

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:236)

98.3 Indvidualise the selection and periodic re-evaluation of a wheelchair/seating support surface and associated equipment for posture and pressure redistribution with consideration to:

- body size and configuration
- the effects of posture and deformity on pressure distribution
- mobility and lifestyle needs

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:236)

98.4 Refer individuals to a seating professional for evaluation.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:237)

98.5 Select a pressure-redistribution cushion that:

- provides contour, uniform pressure distribution, high immersion or offloading
- promotes adequate posture and stability
- permits air exchange to minimise temperature and moisture at the buttock interface
- has a stretchable cover that fits loosely on the top cushion surface and is capable of conforming to the body contours

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:237)

98.6 Assess other seating surfaces commonly used by the individual and minimise the risk they may pose to skin.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:237)

98.7 Seat individuals with pressure ulcers on a seating support surface that provides contour, uniform pressure distribution, and high immersion or offloading.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =B; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:238)

98.8 Use alternating pressure seating devices judiciously for individuals with existing pressure ulcers. Weigh the benefits of off-loading against the potential for shear based on the construction and operation of the cushion.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:238)

98.9 Maintain proper positioning and postural control.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:238)

98.10 Provide adequate seat tilt to prevent sliding forward in the wheelchair/chair, and adjust footrests and armrests to maintain proper posture and pressure redistribution.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:238)

98.11 Avoid the use of elevating leg rests if the individual has inadequate hamstring length.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:239)

98.12 Use variable-position seating (tilt-in-space, recline, and standing) in manual or power wheelchairs to redistribute load off of the seat surface.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:239)

98.13 Encourage the individual to reposition regularly while in bed and seated.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:239)

98.14 Provide appropriate assistive devices to promote bed and seated mobility.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:239)

98.15 Establish pressure relief schedules that prescribe the frequency and duration of weight shifts.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:239)

98.16 Teach individuals to do 'pressure relief lifts' or other pressure relieving manoeuvres as appropriate.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:239)

98.17 Identify effective pressure relief methods and educate individuals in performance of methods consistent with the ability of the individual.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:239)

98.18 Weigh the risks and benefits of supported sitting versus bed rest against benefits to both physical and emotional health.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:240)

98.19 Consider periods of bed rest to promote ischial and sacral ulcer healing.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:240)

98.20 Develop a schedule for progressive sitting according to the individual's tolerance and pressure ulcer response in conjunction with a seating professional.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:240)

98.21 Avoid seating an individual with an ischial ulcer in a fully erect posture in chair or bed.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:241)

98.22 Promote and facilitate self-management for individuals with SCI.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:242)

98.23 Provide individuals with SCI and their caregivers with structured and ongoing education on prevention and treatment of pressure ulcers at a level appropriate to their education background.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:242)

3.12.4 Care of a Critical Care Patient with or At Risk of Developing a Pressure Ulcer

Clinical Question 99: What special considerations should the clinician be aware of when treating a critically ill patient with a pressure ulcer or at risk of pressure ulcer development?

Evidence Statement

Critically ill patients have unique pressure ulcer prevention and treatment needs. Haemodynamic instability, immobility and limited nutrition increase the risk for pressure ulcer development among critically ill patients (Cox, 2011). Although prolonged length of stay in intensive care settings is a significant risk factor, many PUs develop within the first week. Patient age, cardiovascular disease and use of norepinephrine may significantly increase the risk of pressure ulcer development (Grap, 2011). The recommendations below are taken from the NPUAP/EPUAP/PPPIA (2014) guideline. These recommendations are intended to supplement and not replace the general recommendations outlined in this guideline.

Recommendations

99.1 Evaluate the need to change the pressure redistributing support surface for individuals with poor local and systemic oxygenation and perfusion to improve pressure redistribution, shear reduction, and microclimate control. Utilise additional features (e.g., turn assistance, percussion) as needed.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:207)

99.2 Evaluate the need to change the support surface for individuals who cannot be turned for medical reasons, including a temporary oral-pharyngeal airway, spinal instability and haemodynamic instability.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:207)

99.3 Initiate a repositioning schedule as soon as possible after admission.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:207)

99.4 Revise the repositioning schedule in response to assessment of the individual's tolerance to repositioning.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:207)

99.5 Consider slow, gradual turns allowing sufficient time for stabilisation of haemodynamic and oxygenation status.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:208)

Few individuals are truly too unstable to turn. Turning the individual more slowly or in small increments that allow adequate time for stabilisation of vital signs should be considered when possible.

99.6 Consider more frequent small shifts in position to allow some reperfusion in individuals who cannot tolerate frequent major shifts in body position.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:208)

Alert!
Small shifts do not replace selection of a more appropriate pressure redistribution support surface when needed or turning (major shifts in body position) when possible.

99.7 Resume routine repositioning as soon as these conditions stabilise.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:208)

Good Practice Point
A trial repositioning every eight hours should be conducted to determine if frequent repositioning can be re-established.

99.8 Use a foam cushion under the full length of the calves to elevate heels.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =B; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:208)

99.9 Assess critically ill individuals placed in the prone position for evidence of facial pressure ulcers with each rotation.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:209)

99.10 Assess other body areas (i.e., breast region, knees, toes, penis, clavicles, iliac crest, symphysis pubis) that may be at risk when individuals are in the prone position with each rotation.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:209)

99.11 Offload pressure points on the face and body while in the prone position.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:209)

99.12 Minimise shear strain when lateral rotation features are used.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:)

99.13 Assess skin frequently for shear injury.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:209)

99.14 Continue to reposition the individual when using lateral rotation features.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍 (NPUAP/EPUAP/PPPIA 2014:209)

99.15 Reevaluate the need for lateral rotation at the first sign of tissue injury. If indicated and consistent with medical needs, change to a support system with improved pressure redistribution, shear reduction, and microclimate control.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:209)

99.16 Position the individual off the pressure ulcer as much as possible.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:210)

99.17 Consider alternative methods of pressure redistribution (or avoid lateral rotation beds) in individuals with sacral or buttock pressure ulcers.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:210)

99.18 Inspect the pressure ulcer and the peri-ulcer skin for shear injury with every dressing change. Shear injury may appear as deterioration of the ulcer edge, undermining, and/or as increasing inflammation of peri-ulcer skin or the ulcer.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:210)

3.12.5 Care of a Palliative Care Patient With or At Risk of Developing a Pressure Ulcer

Clinical Question 100: What special considerations should the clinician be aware of when treating palliative care patients with a pressure ulcer or at risk of developing a pressure ulcer?

Evidence Statement

Sufficient informed clinical consensus exists to support pressure ulcer management in an individual receiving palliative care and various aspects of evidence-based pressure ulcer management have been discussed from the perspective of an individual receiving palliative care. These need to be taken into consideration in conjunction with those outlined in the general pressure ulcer recommendations of these guidelines. Clinicians should be encouraged to adapt and modify care in accordance with the wishes and goals discussed with the individual and any significant other.

The recommendations below are taken from the NPUAP/EPUAP/PPPIA (2014) guideline. These recommendations are specific to palliative care patients and are in addition to the recommendations within the pressure ulcer section.

Recommendations

100.1 Reposition and turn the individual at periodic intervals, in accordance with the individual's wishes, comfort and tolerance.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:224)

100.2 Pre-medicate the individual 20 to 30 minutes prior to a scheduled position change for individuals who experience significant pain on movement.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:224)

100.3 Consider the individual's choices in turning, including whether s/he has a position of comfort, after explaining the rationale for turning.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍(NPUAP/EPUAP/PPPIA 2014:224)

100.4 Consider changing the support surface to improve pressure redistribution and comfort.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:224)

100.5 Strive to maintain adequate nutrition and hydration compatible with the individual's condition and wishes. Adequate nutritional support is often not attainable when the individual is unable or refuses to eat, based on certain disease states.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:225)

100.6 Set treatment goals consistent with the values and goals of the individual, while considering input from the individual's significant others.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍👍 (NPUAP/EPUAP/PPPIA 2014:225)

100.7 Assess the impact of the pressure ulcer on quality of life for the individual and his/her significant others.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation =👍(NPUAP/EPUAP/PPPIA 2014:226)

100.8 Set a goal to enhance quality of life, even if the pressure ulcer cannot be healed or treatment does not lead to closure/healing.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:226)

100.9 Consider use of external odour absorbers or odour maskers for the room (e.g., activated charcoal, kitty litter, vinegar, vanilla, coffee beans, burning candle, or potpourri).
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:227)

100.10 Educate the individual and his or her significant others regarding skin changes at end of life.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:227)

100.11 Validate that family care providers understand the goals and plan of care.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍(NPUAP/EPUAP/PPPIA 2014:227)

3.12.6 Care of Obese Patients With or At Risk of Developing a Pressure Ulcer

Clinical Question 101: What special considerations should the clinician be aware of when treating an obese (bariatric) patient with a pressure ulcer or at risk of pressure ulcer development?

Evidence Statement

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.

Maintaining skin integrity in the obese patient is a challenge to both the patient themselves and the clinician. According to Rush (2009) the weight of skin folds and skin to skin contact, reduced vascularity and perfusion in adipose tissue may result in a breakdown of skin integrity and consequently poor wound healing. Inflammation on the body folds (interigo) and eczematous lesions resulting from friction and challenges with cleanliness may occur. Particular attention should be paid to the anatomical sites that are subjected to increased pressure from skin folds e.g. under the breasts, panniculus, and groin, which may become necrotic due to restricted blood supply.

Pressure ulcer prevention for bariatric patients is similar to that of the non-bariatric patients but extra attention should be paid to the selection of specialist equipment and manual handling. It is important to minimise friction and shear while positioning the patient correctly (Mastrogiovanni, 2003). All equipment should support the patient's weight and be wide enough to allow repositioning. When implementing moving and handling procedures for bariatric patients, clinicians must adhere to the HSE (2016) National Health and Safety Training Programme.

Recommendations

101.1 Provide safe, respectful care and avoid injuries to both the individual and clinician.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍(NPUAP/EPUAP/PPPIA 2014:202)

101.2 Maximise workplace safety by implementing organisation-wide bariatric management strategies that address manual handling techniques.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍 (NPUAP/EPUAP/PPPIA 2014:202)

101.3 Provide pressure redistribution support surfaces and equipment appropriate to the size and weight of the individual.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍 (NPUAP/EPUAP/PPPIA 2014:202)

101.4 Calculate BMI and classify obesity.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:203)

101.5 Assess all skin folds regularly.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍(NPUAP/EPUAP/PPPIA 2014:203)

101.6 Access adequate assistance to fully inspect all skin surfaces and folds.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍 (NPUAP/EPUAP/PPPIA 2014:203)

101.7 Differentiate inter-triginous dermatitis from Category/Stage I and II pressure ulcers.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:204)

101.8 Refer bariatric individuals to a registered dietitian or an inter-professional nutrition team for a comprehensive nutrition assessment and weight management plan.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍 (NPUAP/EPUAP/PPPIA 2014:204)

101.9 Ensure the individual is provided with a bed of appropriate size and weight capacity specifications.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍 (NPUAP/EPUAP/PPPIA 2014:204)

101.10 Use beds that adequately support the weight of the individual.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:204)

101.11 Check routinely for 'bottoming out' of the support surface.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:204)

101.12 Ensure that the bed surface area is sufficiently wide to allow turning of the individual without contact with the side rails of the bed.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:204)

101.13 Consider selecting a support surface with enhanced pressure redistribution, shear reduction and microclimate control for bariatric individuals.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:204)

101.14 Use wheelchairs and chairs that are wide and strong enough to accommodate the individual's girth and weight.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:205)

101.15 Use a pressure redistribution cushion designed for the bariatric individual on seated surfaces.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:205)

101.16 Check routinely for 'bottoming out' of the cushion.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:205)

101.17 Where appropriate, provide bariatric walkers, overhead trapezes on beds and other devices to support continued mobility and independence.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍 (NPUAP/EPUAP/PPPIA 2014:205)

101.18 Avoid pressure on skin from tubes, other medical devices and foreign objects.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍 (NPUAP/EPUAP/PPPIA 2014:205)

101.19 Use pillows or other positioning devices to offload the pannus or other large skin folds and prevent skin-on-skin pressure.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:205)

101.20 Check the bed for foreign objects.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:205)

101.21 Provide adequate nutrition to support healing.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍(NPUAP/EPUAP/PPPIA 2014:205)

101.22 Assess pressure ulcers carefully for signs of infection and delays in healing.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍 (NPUAP/EPUAP/PPPIA 2014:205)

101.23 Monitor wound dressing materials closely, particularly in large cavity wounds.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍 (NPUAP/EPUAP/PPPIA 2014:205)

3.12.7 Care of Patients in the Operating Theatre

Clinical Question 102: What special considerations should the clinician be aware of when treating patients in the operating theatre?

Evidence Statement

The incidence of pressure ulcer development directly related to surgical procedure in the operating theatre range between 4% and 45% (Schoonhoven et al 2002; Bulfone et al 2012; Pieper 2012). One of the most significant risk factors is the amount of time patients spend on the operating room table (Tschannen 2012; Rao 2016). Schoonhoven et al. (2012) found that for every 30 minutes of anaesthesia after four hours, the risk of PU development increased by 33%.

Selecting appropriate operating theatre bed surfaces should be in line with recommendations for clinical question 78. In addition to the type of surface used, Engels (2016) states that peri-operative personnel should ensure that linens under the patient are not wrinkled and that the patient is free from any fluid or moisture that may have been introduced during the skin preparation process or from other sources. Improper body positioning, inadequate padding of bony prominences and incorrect positioning devices are contributing factors (Black et al., 2014). In a study by Schoonhoven (2002), 37% of patients developed heel ulcers during cardiac surgery. Heels require particular protection, so should be off loaded from the operating table surface.

Vigilance must be maintained with skin inspection in the pre, peri and post-operative phase of surgery and there should be diligent handover of assessment between teams (Spruce, 2017). Black et al. (2014) state that if positional related purple maroon discolouration is present two days after surgery, this may be a key indication that the ulcer started during surgery.

Recommendations

102.1 Consider additional risk factors specific to individuals undergoing surgery including:

- duration of time immobilised before surgery
- length of surgery
- increased hypotensive episodes during surgery
- low core temperature during surgery and
- reduced mobility on day one postoperatively

NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍(NPUAP/EPUAP/PPPIA 2014:218)

102.2 Inspect skin at bony prominences in the immediate pre-op and post-op phase and document and communicate all skin changes (i.e. non-blanchable erythema and purple maroon discolouration).

HSE Recommendation Evidence Grade=D

102.3 Use a high specification reactive or alternating pressure support surface on the operating table for all individuals identified as being at risk of pressure ulcer development.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =B; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:219)

102.4 Position the individual in such a way as to reduce the risk of pressure ulcer development during surgery.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍 (NPUAP/EPUAP/PPPIA 2014:219)

102.5 Use additional support surfaces (e.g. facial pads) to offload pressure points on the face and body while in the prone position.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍 (NPUAP/EPUAP/PPPIA 2014:219)

102.6 Do not position the individual directly on a medical device unless it cannot be avoided.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍 (NPUAP/EPUAP/PPPIA 2014:220)

102.7 Ensure that the heels are free of the surface of the operating table.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍(NPUAP/EPUAP/PPPIA 2014:220)

102.8 Use heel suspension devices that elevate and offload the heel completely in such a way as to distribute the weight of the leg along the calf without placing pressure on the Achilles tendon.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =B; Strength of Recommendation=👍👍(NPUAP/EPUAP/PPPIA 2014:220)

102.9 Position the knees in slight flexion when offloading the heels.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍 (NPUAP/EPUAP/PPPIA 2014:221)

102.10 Consider pressure redistribution prior to and after surgery.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍(NPUAP/EPUAP/PPPIA 2014:221)

102.11 Place the individual on a high specification reactive or alternating pressure support surface both prior to and after surgery.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:221)

102.12 Document the individual's position and the anatomical areas under increased interface pressure during surgery.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍(NPUAP/EPUAP/PPPIA 2014:221)

102.13 Position the individual in a different posture preoperatively and postoperatively than the posture adopted during surgery.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=☝(NPUAP/EPUAP/PPPIA 2014:221)

3.13 Pressure Ulcer Prevention

Clinical Question 103: What measures should be implemented to enhance the skin condition of patients at risk of pressure ulcer development?

Evidence Statement

Dry skin does not have the same protective function as intact skin, therefore increases the patient's risk of pressure ulceration (Martin, 1997). The skin should also be protected from the damaging effects of excess moisture using a barrier product. In the presence of excess moisture, the mechanical properties of the stratum corneum are altered, thereby reducing the patient's resistance to pressure and shearing forces (Carville et al., 2014).

Recommendations

103.1 Keep the skin clean and dry.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍 (NPUAP/EPUAP/PPPIA 2014:66)

103.2 Use a pH balanced skin cleanser.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍 (NPUAP/EPUAP/PPPIA 2014:66)

103.3 Cleanse the skin promptly following episodes of incontinence.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍(NPUAP/EPUAP/PPPIA 2014:67)

103.4 Protect the skin from exposure to excessive moisture with a barrier product in order to reduce the risk of pressure damage.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍 (NPUAP/EPUAP/PPPIA 2014:68)

103.5 Develop and implement an individualised continence management plan.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍👍 (NPUAP/EPUAP/PPPIA 2014:67)

103.6 Avoid positioning the patient on an area of erythema whenever possible.
HSE Recommendation Evidence Grade: D

103.7 Do not massage or vigorously rub skin that is at risk of pressure ulcers.
NPUAP/EPUAP/PPPIA Recommendation: Strength of Evidence =C; Strength of Recommendation=👍(NPUAP/EPUAP/PPPIA 2014:67)

4. Leg Ulceration

A leg ulcer is defined as a defect in the dermis located on the lower leg. Leg ulcers are not a disease entity but rather a symptom of an underlying disease. Vascular disease, both venous and arterial is the most common problem leading to leg ulcers. However, other aetiological factors include infectious diseases, immunological diseases, dermatological diseases, trauma, skin tumours, and lymphoedema. The treatment approaches to these different disease entities vary greatly (Lauchli et al., 2013). Therefore, every patient presenting with a leg ulcer must therefore be assessed by a clinician educated and trained in leg ulcer assessment to identify the underlying disease and to identify the local factors that may impair wound healing (Andriessen et al., 2017).

Venous Leg Ulcers

The majority of leg ulcers are caused by chronic venous insufficiency (CVI) and account for 50-60% of all cases (Lauchli et al., 2013). Venous disease can either be caused by primary varices or by post thrombotic syndrome secondary to DVT. Symptoms of venous disease include:

- leg ache and pain
- tightness
- skin irritation
- feeling of heaviness
- muscle cramps
- tiredness of the legs

Venous leg ulcers (VLUs) are usually located on the medial aspect of the lower third of the leg and around the medial ankle. Less commonly the ulcers may be located at the lateral ankle or on the dorsum of the foot.

Key characteristics which may lead to the diagnosis of CVI are;

- visible capillaries around the ankle (ankle flare/corona phlebectatica)
- trophic skin changes such as hyperpigmentation caused by haemosiderin deposits
- atrophie blanche
- induration of the skin and underlying tissue (dermatoliposclerosis)
- stasis eczema
- oedema

Chronic venous insufficiency is primarily a clinical diagnosis based on these characteristics.

Arterial and mixed ulcers

Peripheral arterial disease (PAD) can be an underlying disease or a contributing factor leading to lower leg ulceration (Hafner et al., 2010). Arterial impairment occurs in 15-20% of venous ulcers (Humphreys et al., 2007). Arterial disease has to be considered or

excluded and always has to be regarded in the clinical context of generalised arteriosclerosis and often occurs in the presence of coronary heart disease or cerebro-vascular disease. There are a number of leg ulcers that are caused solely by arterial occlusion or occur in combination with venous insufficiency (mixed ulcers). Arterial ulcers are typically located on the lateral aspect of the lower leg or on the dorsum of the foot or toes or at pressure points. These ulcers usually present as deep and sharply demarcated ulcers with well-defined borders. Mixed venous-arterial ulcers usually combine clinical characteristics of chronic venous insufficiency and of arterial disease. These ulcers can be located on the medial or lateral aspect of the leg and circumferential extension is common (Humphreys et al., 2007).

A frequently under-recognised cause of leg ulcers related to arterial ulcers is microvascular occlusion in hypertensive ischaemic leg ulcers (HYTILU or Martorell's ulcers) (Hafner et al., 2010). These ulcers occur in people with marked arterial hypertension. Arterial examination is usually normal. Most of these ulcers are very painful and located on the lateral lower leg or over the shin. The ulcer surroundings are highly inflammatory. The diagnosis of these ulcers requires a large, deep biopsy that includes some of the ulcer base but also at least 1cm of surrounding skin and underlying soft tissue to show the arteriolosclerosis.

Atypical Ulcers

Approximately 10-20% of all leg ulcers are caused by other aetiologies (Hafner et al., 2010). Some of these ulcers can be recognised due to their clinical characteristics such as palpable purpura in the surrounding skin which is typical for vasculitis, highly inflammatory borders in pyoderma gangrenosum, or tissue growth resembling hypergranulation in ulcerating skin tumours. Infectious diseases as a cause of a leg ulcer require microbiological examination, often a skin biopsy is necessary to provide the deep tissue sample needed for this. Vasculitic ulcers, some skin diseases and all skin tumours need histological assessment of a skin biopsy to make the diagnosis. Ulcerating skin tumours are not uncommon as a cause of leg ulcers, accounting for up to 3% in some incidences. Many can be initially misdiagnosed as leg ulcers of other aetiologies (Gil et al., 2015). Therefore, biopsy is recommended in all ulcers with atypical appearance and/or no healing tendency after 3 months of treatment.

These recommendations originate from the following documents: 'Management of chronic venous leg ulcers: A national clinical guideline' (SIGN, 2010), the Australian and New Zealand Clinical Practice Guideline for Prevention and Management of Venous Leg Ulcers (The Australian Wound Management Association Inc, The New Zealand Wound Care Society Inc., 2011), 'Management of Chronic Venous Disease: Clinical Practice Guidelines of the European Society for Vascular Surgery' (Wittens et al., 2015), 'Management of venous leg ulcers: Clinical practice guidelines of the Society for Vascular Surgery® and the American Venous Forum' (O'Donnell et al., 2014). Two additional documents which have comprehensively reviewed current leg ulcer guidelines include: Compression therapy for venous leg ulcers: risk factors for adverse events and complications, contraindication – a review of present guidelines by Andriessen et al. (2017) and Management of patients with venous leg ulcers – challenges and current best practice by Franks et al. (2016).

4.1 Assessment of Leg Ulcers

Clinical Question 104: Who should conduct the assessment of patients presenting with a leg ulcer?

Evidence Statement

A holistic assessment is crucial to obtain an accurate diagnosis before progressing to the appropriate management for patients with leg ulcers (Franks et al., 2016, Wounds UK, 2016; Andriessen et al., 2017). Clinicians conducting the assessment of patients with leg ulcers should have the appropriate anatomical and physiological knowledge. This assessment is complex and post basic education and training is recommended (Franks et al., 2016, 2016). The available research and consensus opinion has suggested better patient outcomes when the clinician involved in the patients care has specific training in venous leg ulcer assessment and management (Australian Wound Management Association and New Zealand Wound Care Society [AWMA/NZWCS], 2011; Franks et al., 2016; Andriessen et al., 2017). According to SIGN (2010) 'specialist leg ulcers clinics are recommended as the optimal service for community treatment of venous leg ulcer'.

Recommendations

104.1 A clinician with post basic education and training in the assessment and management of leg ulcers should conduct a comprehensive assessment of all patients presenting with a leg ulcer.

HSE Recommendation Evidence Grade: C

Clinical Question 105: What pertinent medical/family history should be considered when assessing a patient with a leg ulcer?

Evidence Statement

Assessing pertinent medical and family history seeks to identify clinical factors associated with the underlying aetiology and comorbidities that may influence treatment, or require concurrent management (AWMA/NZWCS, 2011; Franks et al. 2016; Andriessen et al., 2017).

The initial assessment should also include pain (refer to section 1.6) and the ulcer history, including duration of the ulcer, any previous ulcers, time without ulcers, effectiveness of previous interventions and the healing time of prior ulcers.

Assessment may also include biochemical analysis, microbiological analysis, nutritional screening, psychological and social assessments. (AWMA/ NZWCS, 2011; Franks et al., 2016).

Refer to appendix XII for a venous leg ulcer assessment flowchart.

Recommendations

105.1 The following factors should be assessed:

- medical and surgical history in the context of a venous leg ulcer, including assessment of comorbidities
- leg ulcer history
- physical examination including examination of the leg and ulcer, including microbiological investigation when applicable
- vascular assessment
- mobility and functional status
- biochemical investigations
- pain history

HSE Recommendation Evidence Grade: C

105.2 The clinician should assess the patient for the following clinical factors indicative of a leg ulcer of venous origin:

- varicose veins
- previous or current DVT
- history of phlebitis
- surgery or trauma of the affected leg
- chest pain, haemoptysis or pulmonary embolism
- multiple pregnancies
- family history of leg ulceration
- obesity
- proven venous disease
- occupations of prolonged standing or sitting

HSE Recommendation Evidence Grade: D

105.3 The clinician should obtain the following specific information from the patient to help develop a comprehensive picture of the disease history:

- the duration of the current ulcer
- previous ulcers and the time they have taken to heal
- time spent free of venous ulcers
- strategies used to manage previous venous ulcers

HSE Recommendation Evidence Grade: C

105.4 The physical status of a patient with a leg ulcer, including their mobility status and lower limb range of movement and strength, should be assessed.
HSE Recommendation Evidence Grade: C

105.5 The clinician should consider the use of biochemical investigations in the assessment of individuals with a leg ulcer. These may include:

- blood glucose level (BGL) and/or haemoglobin A1c (HbA1c)
- haemoglobin (Hb)
- urea and electrolytes
- serum albumin
- lipids
- rheumatoid factor (RhF)
- auto antibodies
- white blood cell count
- erythrocyte sedimentation rate (ESR)
- c-reactive protein (CRP)
- liver function tests (LFT)
- lipid profile

HSE Recommendation Evidence Grade: D

105.6 Nutritional screening should be completed where appropriate.
HSE Recommendation Evidence Grade: D

*Refer to clinical **questions 18 and 19** for further nutritional guidance*

105.7 A pain assessment should be conducted using a validated pain scale and may include:

- location of the ulcer-related pain
- quantity/severity of the pain
- quality/characteristics of the pain
- when pain occurs (for example, at dressing changes, background pain)
- triggers and relievers
- impact of the pain on quality of life

HSE Recommendation Evidence Grade: D

Refer to section 1.6 for further guidance on managing wound pain.

105.8 If clinically indicated a psychosocial assessment using an appropriate, validated tool such as the mini metal examination, the Cardiff Wound Impact Schedule (CWIS), or the Chronic Venous Insufficiency Questionnaire (CVIQ) may be conducted.
HSE Recommendation Evidence Grade: D

Clinical Question 106: What observable changes in the ulcerated legs should be considered during assessment?

Evidence Statement
A bilateral limb assessment should be conducted. There are certain signs and symptoms that are indicators of aetiology (AWMA/NZWCS, 2011). Signs or symptoms in isolation are not enough to base a diagnosis on; grouping of the following signs and symptoms is indicative of an ulcer of venous or arterial origin (AWMA/NZWCS, 2011).

Recommendation:
106.1 Bilateral limb inspection should be conducted to differentiate between leg ulcers of venous and arterial aetiology.
HSE Recommendation Evidence Grade: D

106.2 The following should be considered by clinicians when inspecting for evidence of venous insufficiency:

- haemosiderin deposit
- dilated and torturous veins
- dermato-liposclerosis
- atrophie blanche
- eczema
- hyperkeratosis
- hypersensitivity
- ankle flare
- altered shape of lower leg
- oedema
- evidence of healed ulcers

HSE Recommendation Evidence Grade: C

106.3 The following should be considered by clinicians when inspecting for evidence of peripheral arterial disease (PAD):

- pale or bluish skin discolouration
- decreased hair growth
- hypertrophied nails
- muscle atrophy
- cool temperature

HSE Recommendation Evidence Grade: C

Refer to appendix XII for a pictorial representation of factors.

Clinical Question 107: What investigations should the clinician use to confirm/assess vascular aetiology and severity?

Evidence Statement

It is imperative that a vascular assessment is completed in order to ascertain the underlying aetiology of the ulcer, be it venous, arterial or mixed, and to determine extent and severity of disease (O'Donnell and Balk, 2011; O'Donnell et al. 2014).

Ankle brachial pressure index

This investigation compares ankle systolic pressure to central systolic blood pressure and the resultant index signifies the absence or presence of arterial disease and its severity. Ankle Brachial Pressure Index (ABPI) should always be interpreted in conjunction with the presence or absence of pedal pulses.

ABPI measurement is performed with a sphygmomanometer cuff placed just above the ankle in the supine position and a Doppler probe used to measure the systolic pressure of the posterior tibial and dorsalis pedis arteries of each leg. ABPI is calculated by dividing the systolic ankle pressure by systolic arm pressure. The reproducibility of ABPI varies but is significant enough to be clinically relevant and can detect a change in clinical status.

ABPIs remain an invaluable tool in assessing patients for the presence of PAD; however, information in guidelines on ABPI is conflicting (Andriessen et al., 2017) with significant inter- and intra-observer variability. The accuracy of measurements is both equipment and operator-dependent. ABPIs are therefore suggested as a standard assessment to determine sufficient arterial circulation before starting compression treatment (Andriessen et al., 2017). See Table 4.

Neither pulse palpation nor ABPI measurement are accurate individually and must always be used together and in conjunction with the overall clinical assessment. Reliance on a single cut off point or a single ratio, neither defines the transition between venous and arterial ulceration and fails to consider other factors which may be important when defining the level of compression to apply to a particular limb (Andriessen et al., 2017). If pedal pulses are easily palpable it is quite safe to treat a venous ulcer with compression following full patient assessment by clinicians trained in this assessment (Andriessen et al., 2017). Where pulses are not easily palpable or the foot appears clinically ischaemic in spite of normal pulses, ABPI measurement remains mandatory. Clinicians must work within their scope of practice.

Table 4. ABPI interpretation (Adapted from Andriessen et al., [2017])

Ankle brachial pressure index	Arterial circulation	Compression treatment
ABPI > 1.00-1.3	Normal	Apply compression
ABPI = 0.8-1.0	Mild peripheral disease	Apply compression with caution
ABPI ≤ 0.8-0.6	Significant arterial disease	Use modified compression with caution – refer to specialist
ABPI < 0.5	Critical ischaemia	Do not compress- refer urgently to vascular specialist
ABPI > 1.3	Refer to vascular/diabetic specialist	

Refer to appendix XII for a leg ulcer assessment flow chart.

Recommendations

107.1 A range of investigations can be used by clinicians to confirm presence of vascular disease and document its severity. These include:

- ABPI
- duplex Scan
- Computed Tomography angiography
- toe/brachial pressure index (TBPI)

HSE Recommendation Evidence Grade: C

107.2 The results of ABPI readings should inform referral pathways and the use of compression as per Table 4.

HSE Recommendation Evidence Grade: C

107.3 An ABPI ≤0.90 is indicative of arterial disease and requires risk modification for PAD (smoking cessation, blood pressure and cholesterol control). Refer to General Practitioner for review.

HSE Recommendation Evidence Grade: C

Clinical Question 108: What factors should be considered when assessing the ulcer/wound?

Evidence Statement

VLUs are usually shallow and irregular in shape, often occurring in the medial aspect of the lower third of the leg (Franks et al., 2016). Arterial ulcers are typically located on the lateral aspect of the lower leg or on the dorsum of the foot or toes or at pressure points. They present as deep and sharply demarcated areas of ulceration. A comprehensive assessment should be the initial step upon the patient's presentation as this will indicate what early stage management should be. Ongoing assessment will allow for the further development of the VLU management plan. A VLU with an area less than 5cm² and duration of less than six months at baseline (at start of treatment) are two positive predictors of healing at 24 weeks (Margolis et al., 2000). Other than this, there is a paucity of evidence on healing outcomes based on the condition of the wound bed at the start of treatment, although ulcers with more than 50% of their surface covered with fibrin reportedly take longer to heal than those without (Milic et al., 2009). The condition of the ulcer edges should be assessed for raised or rolled edges (any undermining), changes in colour (red, purple, white) or evidence of contracting or epithelisation, (healing). Raised or rolled edges can delay healing and be a sign of hyper-granulation or malignancy. Colour changes can indicate decreased tissue perfusion, redness or erythema indicating infection or a purple/blue colour indicating malignancy, pyoderma gangrenosum or vasculitis. Refer to section 1.3 for more comprehensive guidance on the assessment of wounds.

Recommendations

108.1 Any abnormalities should be further investigated and referred for specialist opinion.

HSE Recommendation Evidence Grade: D

Clinical Question 109: When should patients with leg ulceration be referred to specialist care?

Evidence Statement

Early referral to a specialist and/or leg ulcer clinic can help ensure appropriate management. Patients with a traumatic injury and history of venous disease should be referred to a local leg ulcer specialist as soon as possible (SIGN, 2010).

Possible indicators for specialist referral include:

- diagnostic uncertainty
- suspicion of malignancy
- treatment of underlying conditions including diabetes, rheumatoid arthritis and vasculitis
- peripheral arterial disease indicated by an ABPI of <0.7/ABPI > 1.3
- contact dermatitis
- ulcer that has not shown any signs of healing within 3 months
- recurring ulceration
- antibiotic resistant infected ulcers
- ulcers causing uncontrolled pain
- healed ulcers with a view to venous surgery
- if management is beyond the scope of practice of the clinician

Recommendations

109.1 If the aetiology of an ulcer cannot be determined on initial assessment by the clinician currently responsible for the patient, referral to a clinician trained and competent in the assessment and management of leg ulceration is required.
HSE Recommendation Evidence Grade: C

109.2 Patients with a non-healing or atypical leg ulcer should be referred for further investigations, including consideration of biopsy.
HSE Recommendation Evidence Grade: C

Clinical Question 110: How often should patients with leg ulceration be reassessed?

Evidence Statement

Once best practice treatment has been initiated, the leg ulcer should show some signs of progression within 2- 4 weeks (Harding et al., 2015). Therefore in order to determine this, measurement and reassessments should be conducted at a minimum of 4 weekly intervals (WUWHS, 2016).

Recommendation

110.1 A reassessment is recommended if the ulcer shows no signs of healing after four weeks or if the patient's clinical status changes.
HSE Recommendation Evidence Grade: C

110.2 Further assessment to exclude other underlying diseases must be performed after 3 months if no healing has occurred or if there is cause for concern prior to this.
HSE Recommendation Evidence Grade: C

4.2 Management of Venous Leg Ulceration

Clinical Question 111: How should the overall skin integrity of the ulcerated limb be maintained?

Evidence Statement

Leg and ulcer hygiene is integral to the maintenance of overall skin integrity. Regular washing and application of topical products achieve this. Compression bandages often impede the patient's ability to maintain their hygiene, so regular dressing changes are important. Specific research studies related to the maintenance of VLU hygiene have not been identified; however, an international clinical guideline on VLU management and a guideline for managing general chronic wounds provided support for these recommendations (SIGN, 2010; AWMA/NZWCS 2011).

Recommendations

111.1 In order to maintain the overall skin integrity of the ulcerated leg the clinician should ensure good leg and ulcer hygiene.
HSE Recommendation Evidence Grade: C

111.2 Cleanse the leg with a pH-appropriate skin cleanser. To obtain optimal ulcer and skin pH, avoid the use of alkaline soaps and cleansers.
HSE Recommendation Evidence Grade: C

111.3 Normal hygiene of the leg should be attended to at each dressing change and the leg dried gently with a clean towel. Hygiene could be achieved through:

- showering in potable water
- washing the leg in a dedicated lined bowl/bucket of potable water
- wiping the leg with a moist single use cloth

HSE Recommendation Evidence Grade: C

111.4 Moisturise to maintain healthy skin.
HSE Recommendation Evidence Grade: C

Clinical Question 112: How should the peri-wound area of a venous leg ulcer be managed?

Evidence Statement

In order to maintain skin integrity and minimise the risk of further ulcerations, good skin care is essential (SIGN, 2010). The peri-wound skin should be treated routinely with an emollient and the ulcer margins protected from maceration with a barrier preparation (SIGN, 2010). Prevalence of venous eczema in patients with venous hypertension is between 3% and 12%. Red, inflamed skin with flakiness or scaling indicates venous eczema. The skin may have blistering or cuts. Venous eczema can result from venous hypertension. Hypersensitivity to topical products also occurs frequently in patients with VLUs, particularly those of long duration requiring ongoing dressings.

Recommendations

112.1 The peri-ulcer skin should be treated routinely with a bland emollient.
HSE Recommendation Evidence Grade: C

112.2 The clinician must determine whether red skin near the ulcer is related to infection, venous eczema and/or hypersensitivity. This may require further investigation or referral.
HSE Recommendation Evidence Grade: C

112.3 The clinician should review current topical agents with consideration to hypersensitivity.
HSE Recommendation Evidence Grade: C

112.4 The clinician should consider the following treatment for venous eczema:

- topical corticosteroids
- topical zinc-impregnated bandages
- other dermatological preparations

HSE Recommendation Evidence Grade: C

112.5 The clinician should consider applying a topical barrier preparation to the peri-ulcer skin to protect it from exudate.
HSE Recommendation Evidence Grade: C

Please see Clinical Question 10 for further guidance on the management of peri-wound skin.

Clinical Question 113: In patients with uncomplicated VLU what first line treatment is indicated?

Evidence Statement

The first line treatment for VLU is compression therapy. The action of compression therapy is based on the application of an external pressure to the limb which compresses superficial and deep veins leading to improvement of the muscle pump function, and thus reduction of ambulatory venous pressure and reduction of oedema (O'Meara et al., 2012; Wittens et al., 2015). An updated Cochrane review concludes that "compression increases ulcer healing rates compared with no compression" (O'Meara et al., 2012).

Refer to appendix XII for a flowchart outlining the suggested management of a venous leg ulcer.

Recommendations

113.1 Compression bandages and walking exercises are recommended as the initial treatment modality to promote healing in patients with a VLU.
HSE Recommendation Evidence Grade: C

113.2 The use of high compression pressures of at least 40mmHg at the ankle level should be considered to promote venous ulcer healing.
HSE Recommendation Evidence Grade: C

Refer to the general section for further guidance on local wound management.

4.3 Management of Venous Leg Ulcers Post-Healing

Clinical Question 114: Is compression necessary once a venous leg ulcer has healed?

Evidence Statement
Patients with a history of chronic venous insufficiency and/or healed leg ulcer should be fitted with the strongest graduated compression hosiery they will comply with (Nelson et al., 2000).

Recommendation
114.1 When a VLU has healed, lifelong medical grade compression hosiery providing 18-40mmHg at the ankle to reduce the long-term effects of venous disease is recommended.
HSE Recommendation Evidence Grade: C

Clinical Question 115: How often should compression hosiery be replaced?

Evidence Statement

There is a paucity of research available to answer this question. In light of the lack of evidence to answer this question compression hosiery should be cared for and replaced according to the manufacturer's instructions.

Recommendations

115.1 Compression hosiery should be replaced at least every six months however frequency of replacement will be influenced by individual wear and tear and manufacturer's instructions.

HSE Recommendation Evidence Grade: D

115.2 The clinician may have to re-measure patients to ensure compression hosiery continues to fit optimally.

HSE Recommendation Evidence Grade: D

Clinical Question 116: What is the role of patient education in the management of leg ulcers?

Evidence Statement

Patient concordance with regimens recommended by the clinician significantly aids both healing and prevention of VLU recurrence (Andriessen et al., 2017). It is therefore crucial that the patient understands the importance of these interventions and their proper implementation (AWMA/NZWCS, 2011; Andriessen et al., 2017).

Patient education includes:

- basic pathophysiology of venous hypertension and VLU
- compression therapy and the role it plays in managing VLUs and venous hypertension, including the potential implications of declining compression therapy
- devices and appliances that may assist in donning and doffing compression garments
- elevation and exercise
- nutrition
- skin care
- potential adverse effects of any therapies and when to seek assistance
- managing comorbidities (e.g. diabetes)

Recommendation

116.1 The clinician should provide verbal and/or written education to improve the patient's knowledge of managing their VLU.

HSE Recommendation Evidence Grade: C

4.4 Management of Mixed Aetiology Ulcers

Clinical Question 117: In patients with mixed aetiology ulcers, what treatment is indicated?

Evidence Statement

The term mixed ulcers normally refers primarily to a venous ulcer in a patient with concomitant PAD. Where the arterial disease is significant there is evidence that inelastic compression improves venous function without compromising arterial perfusion and leads to better healing (Mosti et al., 2012; Andriesen et al., 2017). If the PAD is severe, then arterial intervention is essential to improve perfusion and allow the use of compression dressings.

Refer to table 4 of Clinical Question 102 for guidance on compression therapy.

Recommendations

117.1 Patients with mixed aetiology ulcer should be referred for specialist opinion.
HSE Recommendation Evidence Grade: C

4.5 Management of Arterial Leg Ulceration

Clinical Question 118: In patients with arterial leg ulcers, what treatment is indicated?

Evidence Statement

Arterial ulcers are typically located on the lateral aspect of the lower leg or on the dorsum of the foot or toes or at pressure points (Andriesen et al., 2017). They tend to be deep and sharply demarcated with regular borders. They are usually very painful. They result from critical ischaemia and require urgent referral to a specialist vascular service.

Recommendations

118.1 In a patient with arterial disease, no compression bandages or stockings should be applied if the ABPI is <0.5 or if absolute ankle pressure is less than 60mmHg until the patient has been reviewed by a vascular specialist.

HSE Recommendation Evidence Grade: C

5. Palliative Wound Care

The aim of palliative care is to improve the quality of life of patients and the families of those living with life-limiting diseases (Siouta et al., 2016). This is achieved by promoting physical, psychological, social and spiritual well-being. The cornerstones of palliative care are the prevention and timely management of symptoms associated with advanced illness and life limiting conditions. A life-limiting condition is defined as a condition, illness or disease which is progressive and fatal and the progress of which cannot be reversed by treatment (Mast et al., 2004).

Palliative care patients are at risk of developing complex wounds as a direct result of their disease or due to the side effects of a disease modifying treatment (Naylor, 2001). The aim of wound management is comfort, enhancement of patient's quality of life aligned to the patient's wishes and realistic expectations (Chrisman, 2010;Nenna, 2011).

At end of life, patients are particularly predisposed to developing wounds as they have reduced mobility and function. Multiple co-morbidities and iatrogenic factors within the healthcare environment can further compound the risk of wound development. Maida et al. (2012) identified the most common wounds in advanced illness were; pressure ulcers, skin tears, malignant fungating wounds, venous leg ulcers, diabetic foot ulcers and arterial lower limb ulcers.

Wound treatment at the end of life requires specialised clinical knowledge and skills (Graves and Sun, 2013). It is recognised that there are 'grey areas', and individual referrals may be discussed with the local specialist palliative care service to discuss their appropriateness (National Cancer Control Programme). Currently there are no definitive wound protocols for treating wounds in the palliative setting. Resources available are consensus documents, which include those by the European Oncology Nursing Society [EONS] (2015), Winnipeg Regional Health Authority [WRHA] (2017) and the National Clinical Programme for Palliative Care [NCPPC](2014). These documents were used to inform the following recommendations.

Malignant fungating wounds

The literature suggests that between 5% and 15% of patients with cancer develop a malignant fungating wound (Beh and Leow, 2016) and 10% of patients with metastatic disease develop a malignant fungating wound (Grocott and Cowley, 2001; Meaume et al., 2013).

Malignant fungating wounds occur when a malignant tumour or metastasis infiltrates the skin surface (Grocott and Cowley, 2001). These wounds may involve the afferent vasculature and can develop anywhere on the body, the most frequent site of presentation is the breast. Other sites of presentation include neck, chest, extremities, genitals, head and other areas (Probst et al., 2009). Patients with malignant fungating wounds additionally experience unpleasant symptoms including pain (28.1%), infection,

bleeding, exudate and malodour. These symptoms significantly comprise the patient's emotional and physical well-being, leading to social isolation, fear and guilt, poor self-image, embarrassment and depression (EONS, 2015).

Symptoms associated with malignant fungating wounds

The symptoms associated with malignant fungating wounds are haemorrhage, odour, pain/pruritis and exudation (Woo and Sibbald, 2010). The following recommendations refer to the management options available for these common symptoms.

Refer to section 1.6 for guidance on the management of wound pain.

5.1 Malignant Fungating Wounds

5.1.1 Assessment

Clinical Question 119: How should the needs of patients with malignant fungating wounds be assessed?

Evidence Statement
The EONS consensus document (2015), the clinical practice guideline (WRHA, 2017) and a literature review (Alexander, 2009) informed the following recommendations.

The quality of patient care is strengthened by using tools that support a standardised approach to a comprehensive assessment of the patient (Schulz et al., 2009). A reliable and valid tool can guide the clinician and allow them to work with the patient and their family/carers in setting care goals (Graves and Sun, 2013; Leadbeater, 2016). At a minimum a general wound assessment tool should be used when managing these wounds (*refer to appendix III).* Additionally, there are assessment tools for specific use in the management of malignant fungating wounds (*refer to appendix XIII*), but currently there is a lack of evidence to support one tool over another (EONS, 2015). The tools available are:

- Wound Symptoms Self- Assessment Chart
- TELER System
- Hopkins Wound Assessment Tool
- The Malignant Wound Assessment Tool-Clinical (MWAT-C)
- Toronto Symptom Assessment System for Wounds (TSAS-W)
- Schulz Malignant fungating wound Assessment Tool

Recommendations
119.1 An assessment tool should be chosen based on suitability of the tool to the setting, skills and knowledge of the clinician and individual patient factors.
HSE Recommendation Evidence Grade: D

119.2 When assessing patients with a malignant fungating wound, clinicians should use a tool which captures the physical and psychological impact on the patient with consideration of the caregiver.
HSE Recommendation Evidence Grade: D

119.3 Self-assessments/patient diaries could be used in conjunction with specific wound assessment tools to establish patient care and effective dressing selection.
HSE Recommendation Evidence Grade: C

119.4 The initial assessment should include identification of the cause and stage of cancer and co-morbidities
HSE Recommendation Evidence Grade: D

119.5 Assessment is an on-going process and should be carried out throughout the course of wound management.
HSE Recommendation Evidence Grade: D

5.1.2 Haemorrhage Management

Clinical Question 120: What measures should be taken by carers/clinicians to prevent/minimise the bleeding of malignant fungating wounds?

Evidence Statement

The EONS consensus document (2015) and the clinical practice guideline (WRHA, 2017) informed the following recommendations.

The wound bed of a malignant fungating wound is extremely delicate and bleeds easily (Wilson et al., 1986; Seaman, 2006). The choice of dressing, its application and removal are important considerations in the prevention of bleeding (Chrisman, 2010).

Recommendations

120.1 Clinicians should apply the following measures in order to prevent/minimise bleeding from the wound site:

- gentle cleansing of the wound
- non-adherent dressings
- maintain a moist interface between the dressings and wound
- gentle application and removal of dressings
- in cases where dressings become adherent to the wound, ensure adequate soaking of the dressing with warm normal saline, followed by careful removal of the dressing
- avoid unnecessary dressing changes

HSE Recommendation Evidence Grade: D

Clinical Question 121: How should bleeding from malignant fungating wounds be managed?

Evidence Statement

Literature reviews (Sibbald et al., 2000; Seaman, 2006; Chrisman, 2010; Woo and Sibbald, 2010) explore the management of a bleeding malignant fungating wound. Woo and Sibbald (2010) recommend several different types of topical haemostatic agents which could be used in the treatment of malignant fungating wounds, these recommendations must be interpreted with caution as they are based on opinion and clinical experience with no apparent reference made to outcome trials. Similarly, Chrisman (2010) and Seaman (2006) form recommendations based on case studies alone.

The EONS consensus document (2015), a clinical practice guideline (WRHA, 2017) and 'Advanced Breast Cancer: Diagnosis and Treatment' (NICE, 2009) informed the following recommendations.

Radiotherapy and Electro-chemotherapy may sometimes help to control repetitive bleeds (Gehl and Geertsen, 2006).

Recommendations

121.1 Bleeding should be controlled as much as possible, using oral or topical haemostatic agents (*Refer to appendix XIII).* This decision should be based on clinical judgement and individual patient assessment.
HSE Recommendation Evidence Grade: D

121.2 Consider specialist referral of patients with repetitive bleeds for radiotherapy or electro-chemotherapy.
HSE Recommendation Evidence Grade: D

Clinical Question 122: How should episodes of severe haemorrhage in patients with malignant fungating wounds be managed?

Evidence Statement

The EONS consensus document (2015), the clinical practice guideline (WRHA, 2017) and 'Advanced Breast Cancer: Diagnosis and Treatment' (NICE, 2009) informed the following recommendations.

Recommendations

122.1 Patients at risk of major haemorrhage:

- should be identified and family and care givers should be sensitively prepared
- end of life decision making should be based on comfort and optimising quality of life
- an 'as required' sedative should be prescribed and available for use in an emergency situation

HSE Recommendation Evidence Grade: D

122.2 Pre-emptive measures should be put in place to deal with the potential for a severe haemorrhage when treating patients with malignant fungating wounds**.**

HSE Recommendation Evidence Grade: C

122.3 An emergency box with suitable dressings, medications (e.g. haemostatic agents) and dark towels (to disguise haemorrhage), should be accessible as a pre-emptive measure in consultation with the patient and MDT.

HSE Recommendation Evidence Grade: D

122.4 Relevant instructions and advice should be provided for both patient/carer and clinician to assist in relieving distress for the patient/family.

HSE Recommendation Evidence Grade: C

122.5 In cases of moderate to heavy bleeding, radiotherapy may be considered and the malignant fungating wounds and patient status should be assessed for feasibility of this measure.

HSE Recommendation Evidence Grade: C

5.1.3 Odour Management

Clinical Question 123: How should a malodourous malignant fungating wound be managed?

Evidence Statement
Malignant fungating wounds often produce a greater odour than other wounds and this may be as a result of the presence of clinical infection, high levels of exudate or necrosis, or slough tissue (Ashworth and Chivers, 2002; Schiech L, 2002; Gethin, 2010; Haas and Moore-Higgs, 2010; Woo and Sibbald, 2010). A malodourous wound can have a negative impact on the patient leading to physical, psychological and emotional distress at a time when they are already vulnerable (Young, 2012).

The evidence to support the following recommendations is informed by a systematic review (da Costa Santos et al., 2010), Cochrane systematic review (Adderley and Holt, 2014), literature reviews (Gethin, 2006; Chrisman, 2010; Bergstrom, 2011) and a clinical practice guideline on 'Malignant fungating wounds' (WRHA, 2017) in conjunction with guidance from consensus documents (NICE, 2009; EONS, 2015).

Recommendations
123.1 Management of malodourous malignant fungating wounds should include treating the cause of the odour in conjunction with reducing the odour where possible.
HSE Recommendation Evidence Grade: D

123.2 Malodourous malignant fungating wounds should be cleansed daily to reduce odour by removing debris and bacteria.
HSE Recommendation Evidence Grade: D

123.3 Appropriate wound dressings that are capable of absorbing both exudate and odour should be applied to malignant fungating wounds.
HSE Recommendation Evidence Grade: C

123.4 The following types of dressings may be effective in the treatment of wound malodour:

- activated charcoal dressing
- topical antimicrobial gel
- topical antimicrobial dressings

HSE Recommendation Evidence Grade: D

123.5 Consideration should be given to the patient's environment. The use of room deodourisers may be considered upon consultation with the patient.
HSE Recommendation Evidence Grade: D

123.6 The patient should be involved as much as possible in the selection of dressing products and adjuncts to assist in the management of wound malodour.
HSE Recommendation Evidence Grade: D

123.7 Systemic antibiotic/antimicrobial treatments may need to be considered if there is evidence of infection, which will help with controlling odour by reducing bacteria.
HSE Recommendation Evidence Grade: D

Clinical Question: 124: How should pain associated with malignant fungating wounds be managed?

Evidence Statement

A guidance document (EONS, 2015) and clinical practice guidelines (Regional Health Authority, 2017; NICE 2009) addressed this question. The WHO (1986) analgesic ladder is recommended for cancer pain management when devising a pain management plan for patients with malignant fungating wounds (Naylor 2001; NICE 2009).

Recommendations

124.1 An interdisciplinary approach should be employed to ensure comprehensive management of wound pain associated with malignant fungating wounds.
HSE Recommendation Evidence Grade: B

124.2 Following a thorough assessment of the pain, appropriate analgesic measures should be employed to manage/control pain.
HSE Recommendation Evidence Grade: D

124.3 If analgesic drugs are being prescribed, the WHO guidelines (1986) for the control of cancer pain should be used *(refer to appendix XIII).*
HSE Recommendation Evidence Grade: D

124.4 Referral to specialist palliative care team should be considered if symptoms and/or pain are outside the scope of the treating clinician.
HSE Recommendation Evidence Grade: D

124.5 Some neuropathic pain can be opioid sensitive and therefore rather than stopping an opioid, an adjuvant analgesic agent should be considered.
HSE Recommendation Evidence Grade: D

124.6 Non- steroidal anti-inflammatory drugs should be considered for painful skin surface pain.
HSE Recommendation Evidence Grade: D

124.7 Non-pharmacological techniques such as relaxation, distraction and therapeutic touch should be considered.
HSE Recommendation Evidence Grade: D

Clinical Question 125: How can procedural pain be managed in the treatment of patients with malignant fungating wounds?

Evidence statement

The clinical recommendations for the management of procedural pain in patients with Malignant fungating wounds were formulated based on a consensus document (EONS, 2015) and clinical practice guidelines (NICE 2009; WRHA, 2017).

Recommendations

125.1 The clinician should exercise caution in order to minimise pain during wound care procedures.
HSE Recommendation Evidence Grade: D

125.2 Gentle irrigation should be used to cleanse a malignant fungating wound.
HSE Recommendation Evidence Grade: D

125.3 Clinicians should use non/low adherent products for the management of malignant fungating wounds.
HSE Recommendation Evidence Grade: D

125.4 The clinician should ensure a moist wound/dressing environment is maintained to reduce dressing adherence in malignant fungating wounds.
HSE Recommendation Evidence Grade: D

125.5 The clinician should avoid unnecessary manipulation of the wound and the dressing.
HSE Recommendation Evidence Grade: D

125.6 If the patient is nearing the end of life, dressings should only be changed if they are saturated or malodourous or are a discomfort to the patient.
HSE Recommendation Evidence Grade: D

5.1.4 Assessment of Wound Exudate

Clinical Question 126: How should exudate from a malignant fungating wound be assessed?

Evidence Statement

A consensus document (EONS, 2015), clinical practice guidelines (NICE 2009; WRHA, 2017) and several literature reviews (Draper, 2005;Seaman, 2006; Chrisman, 2010; Woo and Sibbald, 2010; Bergstrom, 2011) were reviewed.

Wound exudate in malignant fungating wounds is the result of increased capillary permeability caused by the disorganised tumour vasculature (Naylor, 2002). Excessive levels of exudate can lead to maceration of the wound and fluid handling challenges, the presence of which can greatly disturb the patient (Lo et al., 2012). Excessive exudate may also be a contributory factor to odour control. Comprehensive assessment is fundamental to its management (Probst et al., 2009).

See clinical question 6 of the general wound section for guidance on the assessment of wound exudate, as the same principles apply to malignant fungating wounds.

Clinical Question 127: How should wound exudate be managed in a patient with a malignant fungating wound?

Evidence Statement

Literature reviews (Draper, 2005; Seaman, 2006; Woo and Sibbald, 2010; Chrisman, 2010; Bergstrom, 2011), a consensus document (EONS, 2015) and clinical practice guidelines (NICE, 2009; WRHA, 2017) were reviewed.

The literature describes a variety of dressings that have been designed to manage wound exudate. Wound dressings should be changed according to the amount of exudate to prevent maceration and irritation of the surrounding skin, and in accordance with the patient's ability and preference (WRHA, 2017: EONS, 2015). Dressings suitable for malignant fungating wounds with high levels of wound exudate include supra-absorbent dressings, alginate and hydrofibre dressings, foam dressings and non-adherent wound contact layers, such as soft silicone, with a secondary absorbent dressing.

Refer to clinical question 6 for recommendations on the management of exuding wounds.

Clinical Question 128: How should wound infection be managed in a patient with a malignant fungating wound?

Evidence Statement

Literature reviews (Chrisman, 2010; Woo and Sibbald, 2010; Bergstrom, 2011;Maida et al., 2012; Graves and Sun, 2013;) along with guidance documents (NICE, 2009; EONS, 2015; WRHA, 2017) were used to formulate the following recommendations.

Topical antimicrobial therapy is the intervention most frequently referred to in the literature. Graves and Sun (2013) conclude that topical antimicrobials are advised for the treatment of superficial wound infection, but highlight that no one topical product is superior over another. Metronidazole has been shown to be an effective treatment for malignant fungating wound infection and is among the most commonly used antimicrobials in clinical practice (Gethin, 2010). Suitable dressing selection can support the prevention and treatment of superficial infections (Graves and Sun, 2013; Chrisman, 2010). The use of antibiotics should be monitored to prevent excessive and inappropriate use, which may lead to an increase in adverse symptoms such as nausea and vomiting and in some cases an overgrowth of resistant organisms (Chrisman, 2010).

Debridement may be considered as a therapeutic modality (Woo and Sibbald, 2010). This should only be performed with extreme caution by appropriately skilled clinicians in controlled and supported environments.

Recommendations

128.1 Clinicians should apply appropriate dressings to assist in the prevention of wound infection.
HSE Recommendation Evidence Grade: D

128.2 Local bacterial colonisation is a risk in malignant fungating wounds and should be treated using appropriate cleansing techniques and topical applications.
HSE Recommendation Evidence Grade: D

128.3 Clinicians should choose an appropriate antimicrobial dressing if infection is present or suspected *(refer to appendix VII)*.
HSE Recommendation Evidence Grade: D

128.4 If there are signs of systemic infection, the use of oral or intravenous antibiotics should be considered.
HSE Recommendation Evidence Grade: D

128.5 The use of antibiotics should be monitored to prevent excessive and inappropriate use which may lead to an increase in adverse symptoms such as nausea and vomiting, and in some cases an overgrowth of resistant organisms.
HSE Recommendation Evidence Grade: C

Clinical Question 129: What dressings are recommended in the management of malignant fungating wounds?

Evidence Statement

The following recommendations are based on a consensus document "(EONS, 2015), a Cochrane Review (Adderley and Holt, 2014) and a systematic review (Chrisman, 2010).

Chrisman (2010) concludes that a series of case studies support the use of activated charcoal dressings for infected and malodourous wounds. Findings from a review of patients' experiences with fungating wounds and associated quality of life (Gibson and Green, 2013) stressed the important impact appropriate dressing selection can have on the patient's quality of life.

Recommendations

129.1 Appropriate non/low adherent wound dressings that are capable of absorbing both exudate and odour should be applied to malignant fungating wounds.
HSE Recommendation Evidence Grade: D

6. Wound Management Education

Despite the advances in wound management during the last two to three decades, implementation of effective wound care practice remains non-standardised (Flanagan, 2005). Many factors have been identified as contributory barriers to the implementation of best practice, including influences of practice based knowledge on clinical decision making (Boxer and Maynard, 1999). Evidence based wound management is often based on expert opinion rather than on research findings (Jeffcoate and Harding, 2003). Expert opinion may vary between discrete professional groups and in different countries resulting in conflicting advice and recommendations. The clinician needs unambiguous solutions to practical problems rather than contradictory findings from different sources (Flanagan, 2005). The impediments to the implementation of best practice in wound care can be categorised into clinical, educational, psychosocial and professional/organisational issues (Flanagan, 2005). This highlights that cultural and organisational influences are as significant as knowledge and expertise in attaining successful wound care outcomes. Therefore, multi-faceted strategies are required to achieve the necessary cultural shift and to ensure quality improvement in practice (McKenna et al., 2004).

Clinical Question 130: What are the components that contribute to the implementation of best practice in wound management?

Evidence Statement

Providing optimum evidence based wound care is a challenge. A generic approach to guideline implementation may not change clinical practice. A multi-faceted approach that combines several methods such as education, opinion leaders, clinical audit and feedback appears to be the most effective. The arguments are compelling that the team approach to wound care is fundamental. No profession has the exclusive skills required to address the complex needs of individuals with wounds. Collaborating across professional borders with the patient and family in focus also demands that clinicians develop the skills for; teamwork, communication, patient and family education and recognising when it is appropriate and timely to consult and refer (Moore et al., 2014).

Recommendations

130.1 The implementation of clinical guidelines requires a multi-faceted approach combining several methods that include education, organisational systems and a quality agenda that promotes efficacy and professional accountability and encourages continuous improvement.

HSE Recommendation Evidence Grade: D

Clinical Question 131: What are the education and training requirements in wound management for clinicians?

Evidence Statement

There is general consensus that undergraduate education should provide students with a minimum understanding of caring for patients with compromised tissue viability and also of the preventative interventions that are essential to promote skin integrity. Education is a vehicle to transfer the knowledge and skills required to promote a health care service that has quality at its core (Ousey, 2010). Gottrup (2012) highlights that there is no consensus on the minimum education requirement to become an educated clinician in wound healing.

There is less evidence available to indicate if undergraduates in other disciplines such as medicine consider their education on wound care as adequate. The tenets of the Quality Agenda also needs to be emphasised to the undergraduate so that they understand the importance of maintaining a safe environment for patient care and that they are able to quantify their actions (Ousey, 2010).

Key findings from a study by Williams and Deering (2016) of medical trainees highlighted the increased demand for medical involvement in interdisciplinary wound care. These findings support the need for dedicated postgraduate wound care training. Following the introduction of a wound care competency model, postgraduate trainee doctors reported enhanced knowledge and application to practice in basic wound care assessment and treatment.

Fletcher (2007) suggests that a more structured systematic approach to on-going education should be adopted to ensure;

- equality of opportunity
- quality of the information provided
- quality of the educational experience
- relevance to clinical practice

Fletcher (2007) further advocates for a partnership approach between the health service providers, the higher education institutions and industry to ensure consistency in updates and developments. Moreover, Flanagan (2005) argues that education has a limited value unless it is sustained, perceived to be relevant and is applied in practice.

Recommendations

131.1 Standardisation of education and training in wound management especially in undergraduate programmes for all clinicians is fundamental to optimising wound treatment.

HSE Recommendation Evidence Grade: D

Clinical Question 132: What competencies in tissue viability are required by the registered nurse?

Evidence Statement
The complexity of the role of nurses in relation to tissue viability has been succinctly discoursed by Ousey et al. (2016) and White (2008).

White (2008) identified that the role emphasised:

- competence in acute and chronic wound care
- the ability to adopt preventative measures to avoid skin and soft tissue injury
- protective skin measures especially for the patient 'at risk" from trauma, maceration and peri wound excoriation
- knowledge of vascular and circulatory anatomy and physiology and aspects of dermatology
- the ability to assess the patient's suitability for compression.

Guest et al. (2015) and Andriessen et al. (2017) reinforced the tenets of White's recommendations. They further elaborated on the vital need for the patient to be reviewed by the appropriately skilled clinician to ensure an accurate diagnosis, prompt initiation of appropriate treatment and avoidance of complications.

Recommendation
132.1 Tissue viability is a core competency of the nurse's role. This imposes a professional responsibility on each nurse to maintain his/her knowledge and skill in tandem with new developments and new research findings.
HSE Recommendation Evidence Grade: D

Clinical Question 133: What is the role of the mentor-mentee relationship in wound management training and education?

Evidence Statement

The value of the mentor-mentee relationship in supporting all clinicians both at undergraduate and postgraduate level has been highlighted (Gottrup, 2012; Guest et al., 2015). This relationship has been pivotal to developing their knowledge and skills base and also for promoting the integration of evidence based care in practice. Under the supervision of the mentor in practice learners are able to link the underpinning principles to the specific health care system.

Ousey (2010) proposes that tissue viability nurse specialists are in the ideal position to undertake the role of mentor. The practical concern is that proportionally, the number of clinical nurse specialists in wound care is small in comparison to the general nurse population. This also applies to other clinicians.

Recommendation

133.1 The theoretical principles of wound management must be supported by a structured mentor-mentee relationship in clinical practice. This allows the mentee to develop critical, analytical and problem-solving skills.

HSE Recommendation Evidence Grade: D

Clinical Question 134: What must the clinician foster in the therapeutic relationship to promote patient empowerment in wound management?

Evidence Statement:
Stacey (2016) advocates that clinicians providing patient-centred wound care need to identify the patient's individual needs and determine which of these may pose potential barriers to wound healing. The expert working group (2012) highlights that the concept of wellbeing encapsulates a number of factors, including social, psychological, spiritual as well as physical. They also emphasise that well-being is influenced by culture and context, and is independent of wound type, duration or care setting.

Therefore, optimising well-being for the patient with a wound will require interaction between the clinician, the patient, their families and carers and the health care system. This will promote empowerment of the patient, contribute to ensuring engagement in their own care and ultimately enhance concordance with therapy.

Recommendations
134.1 Clinicians providing patient-centred care need to consider the patient's individual needs and circumstances and identify with them the specific potential barriers to wound healing
HSE Recommendation Evidence Grade: D

134.2 Additional education and training of clinicians should be provided to conduct accurate risk assessment and promote/encourage preventative care.
HSE Recommendation Evidence Grade: D

Clinical Question 135: What are the essential components required by a team to ensure successful wound management?

Evidence Statement

The terms multi-disciplinary, inter-disciplinary, cross-disciplinary and trans-disciplinary are frequently used, sometimes interchangeably, to describe working as a team in various healthcare settings. Each term describes a different approach therefore, they should not be used interchangeably; in most of these teams the different disciplines within the team work independently within their own areas of specialisation. In an effort to illuminate the importance of the team in effective wound care, the European Wound Management Association (EWMA) initiated a joint project with the Association for the Advancement of Wound Care (USA) and The Australian Wound Management Association to present a model for the Team approach to Wound Care (Moore et al., 2014).

This joint position document proposes five elements as essential to effective management of wounds as a team. These include; a patient advocate referred to as the "wound navigator", responsive referral mechanisms, a system to enable aggregation of assessment data to formulate a single management plan and a health care system sensitive to team models. All ingredients that foster co-operation, coordination and collaboration among members of different professions to facilitate the delivery of patient-centred care are recommended. High performance work teams will not occur naturally, they must be created and managed (Eggenberger et al., 2014). This demands a significant change in culture both within the organisation and care delivery unit as well as within the academic educational programmes. Students of differing disciplines need to be exposed to a collaborative model of learning where they learn to work as a team, how to communicate, fostering trust and respect and also learn the skills of discourse to ensure the optimum outcome for the patient.

Recommendation

135.1 Opportunities for interdisciplinary education both at undergraduate and postgraduate level need to be developed. This will foster recognition and respect for the individual disciplines' perspective. The problem solving process for the management of challenging wounds will be enhanced.

HSE Recommendation Evidence Grade: D

Clinical Question 136: How may quality improvement be assured in the provision of wound care?

Evidence Statement

Cultural and organisational issues are especially important in effecting change and ensuring evidence based patient care is provided. Fostering a stable work force and ensuring an appropriate skill mix are integral to an effective team working cohesively. Leadership, managerial support and the promotion of evidence-based care as an organisational priority are equally influential on successful outcomes. Staff motivation is influenced by the existence of all these processes within the work environment (Elliott, 2017). Other factors that have been identified to assist with sustaining change and quality improvement are; the use of continuous quality improvement methods outcome of process measures e.g. Audit and Feedback, Plan Do Study Act (PDSA), Lean/Six Sigma process mapping or root cause analysis. These facilitated the uptake of improvements in the workplace (Pagan et al., 2015). Other motivational and confidence building sources that have been associated with improving success were the use of external mentors who provided expert advice and guidance (Timmerman et al., 2007).

Embedding change within a culture equally requires sustaining improvement strategies over a prolonged time interval. Some studies have demonstrated quality improvement processes in place three years or more post intervention. The evidence clearly demonstrates a direct correlation between the duration of support measures and sustained improvements (Pagan et al., 2015). Professional accountability is identified as an integral component of ensuring a safe effective standard of care, yet there is little consensus as to which profession has responsibility and accountability for wound care decisions (Ashton and Price, 2006; Eggenberger et al., 2014). In some circumstances and settings the role has been delegated to the nurse but observational studies highlight that medical personnel continue to dominate prescriptive wound practices in many settings (Ashton and Price, 2006). The Institute of Internal Medicine has identified an urgent need for high functioning teams to address the increasing complexity of information and inter professional connections required in contemporary health care (Mitchell et al., 2012). Combining the challenges of complex health care with the increasing emphasis on the adoption of a patient-centred approach to care delivery also argues strongly for a team based approach towards achieving the most effective goals in wound care

Recommendations

136.1 There should be a commitment/agreement from the leaders within the appropriate governance structures who have the responsibility and authority to approve changes in the local organisation resulting from the clinical audit process.
HSE Recommendation Evidence Grade: D

136.2 All relevant clinicians should be involved in the quality initiative that is being used with collaborative commitment to the implementation of the outcomes.
HSE Recommendation Evidence Grade: D

136.3 Multidisciplinary team members should work together on audit to ensure a successful outcome for the audit.
HSE Recommendation Evidence Grade: D

136.4 The findings of the audit should be incorporated into a sustainable continuous improvement programme.
HSE Recommendation Evidence Grade: D

Part B: Guideline Development Cycle

1.0 INITIATION

The first edition of the Best Practice and Evidence Based Guidelines for Wound Management (HSE, 2009), was designed to support the standardisation of treatment and care and encourage best clinical practice in order to improve patient outcomes. Since 2009, advances and developments in wound care management necessitate their revision. These include:

- The impact of local factors such as wound bio burden and the volume of wound exudate on wound healing are more clearly understood (Flanagan, 2013)
- The use of antiseptics is being re-evaluated (Leaper et al., 2015)
- Innovative technologies have led to new, more sophisticated wound based treatments, increasing choice and challenging clinicians to increase their skills base
- There is greater recognition of the effects of complex wounds on the quality of life and the psychosocial perspective of the patient (Ousey and Edward, 2014)

The quality agenda requires us to consider the principles of patient safety, clinical effectiveness and patient satisfaction (Ousey, 2010; Flynn, 2016). The application of these principles in the context of wound care challenges the clinician on occasions where wound healing is not always achievable and where patient satisfaction and quality of life are paramount.

1.1 Purpose

The purpose of the HSE National Wound Guidelines 2018 is to provide a standardised consistent approach for wound care in Ireland. The guideline will support safe, quality care for patients, who access healthcare across the HSE and HSE funded agencies.

Wounds may be caused by trauma, surgical intervention or as a result of an underlying systemic condition, and may be acute in nature e.g., an abrasion or laceration. Chronic wounds e.g. leg ulcers, are those that do not progress through the healing process in a timely manner and are often associated with comorbidities (Guo and DiPietro, 2010; Nunan et al., 2014).

This revised publication is informed by international guidelines and aims to support pathways of care for patients with a wound. It is expected that it will be accessible to all disciplines and offer recommendations for best practice.

1.2 Scope

While these guidelines and the general principles of wound management largely apply to the care of all wounds, particular emphasis in this document is on wounds most commonly encountered in routine clinical practice and which provide many challenges to practitioners. The guideline is organised into the following sections:

- General wound care
- Diabetic foot ulcers
- Pressure ulcers
- Leg ulcers
- Palliative wound care
- Education

The needs of special populations with wounds are addressed in the relevant sections. Other wounds such as burns are usually treated in specialist units, therefore are not dealt with specifically in this guideline. However, clinicians may find the following consensus document helpful in the management of non-complex burns: International Best Practice Guidelines: Effective skin and wound management of noncomplex burns: Wounds International, 2014.
http://www.woundsinternational.com/media/issues/943/files/content_11308.pdf

1.2.1 Target user

The guideline is a resource for all clinicians in wound care practice.

1.2.2 Target population

Healthcare staff, doctors, nurses, midwives and health and social care professionals involved in the care of patients, residents or clients, adults and children with an acute or chronic wound.

The CEO, General Manager, Clinical Director and the Director of Nursing and/or Midwifery of health service providers have corporate responsibility for the implementation of the recommendations in this guideline. Each member of the multidisciplinary team is clinically and professionally accountable for implementing the recommendations relevant to their discipline.

1.3 Aim and Objectives

1.3.1 Aim

To provide current evidenced based recommendations for wound care practice.

1.3.2 Objectives

To promote a standardised approach to wound management across all care settings.

1.4 Outcomes

It is anticipated that these Guidelines will enhance or improve patient outcomes.

1.5 PPPG Development Group

1.5.1 The Guideline Review Group

The Guideline Review Group (GRG), directed by the project lead, undertook a comprehensive review of a wide range of literature and regulation to inform the revision of this guideline. The group, collaborated extensively on this revision, and it was circulated nationally and internationally for consultation and peer-review.

1.5.2 Membership of the Guideline Review Group

The GRG and the work-stream groups (WSGs) comprised professional clinical experts representing various wound care pathways and disciplines. The project lead worked with all resources to undertake and implement the project. The WSGs were responsible for providing expert advice, support and assistance to the project lead. All project management plans were reviewed and approved by the project team.

Refer to appendix XIV for details of the membership of the GRG.

1.5.3 Conflict of Interest

As indicated by the completed 'conflict of interest forms' (*appendix XV*), no conflicts of interest were noted.

1.5.4 Funding Body and Statement of Influence

The guideline was commissioned and funded by the HSE. This process was fully independent of lobbying powers. All recommendations were based on the best research evidence integrated with clinical expertise.

1.6 Governance Group

The Director of the Office of Nursing and Midwifery Services and the National Director of Clinical Strategy and Programmes commissioned this project. The Office of Nursing and Midwifery Services sponsored this project and had the authority and responsibility for managing and executing the project according to the project plan. The Project Lead (who reports to the Director of the Office of Nursing and Midwifery Services), managed, coordinated and administered the process.

The Director of the ONMSD is grateful to the health service organisations and members of Higher Education Institutions (HEIs) whose educationalist, practice development and clinical staff involved gave their time, expertise and educational material.

1.6.1 Membership of the Approval Governance Group

Refer to appendix XVI for Membership of the Approval Governance Group.

1.7 Supporting Evidence

References can be found in Section 8.0. Other supporting evidence is located within the appendices.

1.7.1 Legislation and other related Policies

A number of documents, listed below, informed the guideline from a legislation and policy perspective.

- The Psychological Society of Ireland (2010) The Codes of Professional Conduct and Ethics for all the relevant Professional Disciplines.
- Nursing and Midwifery Board of Ireland (2015) Scope of Nursing and Midwifery Practice Framework
- Health Information and Quality Authority (2012) National Standards for Safer Better Healthcare
- Health Service Executive (2011) Standards and Recommended Practices for Healthcare Records Management
- Health Service Executive (2016) National Framework for developing Policies, Procedures, Protocols and Guidelines (PPPGs)
- Health Service Executive (2017) Integrated Risk Management Policy

These were the current versions of these documents at the time of publication of this guideline.

1.7.2 Guidelines being replaced by this guideline

Health Service Executive (2009) National Best Practice and Evidence Based Guidelines for Wound Management.

1.7.3 Related PPPGs

Currently there are no other national PPPGs related to this guideline.

1.8 Glossary

Refer to *appendix XVII* for a full glossary.

2.0 GUIDELINE DEVELOPMENT

2.1 The Clinical Questions

The clinical questions informing the revision of the 2009 guideline, determined the need for a robust literature search, to identify the most current evidence underpinning the areas of wound care discussed in this guideline.

2.2 Literature Search Strategy

A comprehensive literature review of existing wound management guidelines was undertaken which included national and international publications. Guidelines sourced were appraisal by two reviewers, using the Agree II tool (Brouwers et al., 2010). Based on Agree II scores, decisions were made on which guidelines to include in the development of this document.

To address gaps in existing wound management guidelines, specific research questions were formulated using the population, intervention, comparison and outcome (PICO) framework and a literature search was undertaken to answer the questions posed. All results were reviewed by the work streams and helped in the generation of recommendations presented in this document. Searching and screening was conducted independently by each work stream, each consisting of at least 3 reviewers, which increased confidence that all relevant and current evidence were identified for the review.

Refer to appendix XVIII for the full search strategy including databases and online search resources used.

2.3 Evidence Appraisal

2.3.1 Data Extraction

The following data was extracted using a bespoke data extraction tool: author, title, source; date of study, country of origin; care setting; inclusion and exclusion criteria; baseline participant characteristics; study design details; specific initiative under investigation (with definitions); length of follow-up; loss to follow-up and outcomes data.

2.3.2 Data Analysis

The literature review was performed according to international standards by following the Cochrane Guidelines (http://handbook.cochrane.org/) as well as the PRISMA Guidelines (http://www.prisma-statement.org/). This review followed the Cochrane guidelines and specifications set out as a requirement of a thorough, objective and reproducible search of a range of sources to identify as many relevant studies as possible. Transparent and complete reporting of the literature review followed the

PRISMA guidelines (Moher et al., 2009) and AGREE II instrument (Brouwers et al., 2010) for reporting on clinical guidelines.

2.3.3 Quality Appraisal

Each included study was quality appraised using the evidence based literature critical appraisal checklist devised by Glynn (2006). This checklist appraised the study under the following domains:

- Population
- Data Collection
- Study design
- Results

The critical appraisal checklist has a number of subcategories, and each is assessed using a yes, no, unclear, or a not applicable rating. Calculation for each section's quality is as follows: (Y+N+U=T). If Y/T <75% or if N+U/T > 25%. In this project the calculation for the total validity was as follows: (Y+N+U=T). If Y/T ≥75% or if N+U/T ≤ 25% then it was concluded that the study was of sound quality. The critical appraisal tool provided a thorough, generic list of questions that one would normally ask when attempting to determine the validity, applicability and appropriateness of a study, either qualitative or qualitative, since the tool allows for the use of non-applicable for questions that are not relevant to the particular study under examination.

2.4 Grading of recommendations

The recommendations in this guideline originate either directly from existing guidelines or were formulated by members of the GRG, based on evidence gathered in response to PICO questions posed. As per ADAPTE (2009) guidance for documents of this nature, an original grading scheme was developed and used to grade all recommendations, except recommendations in the pressure ulcer section which unless otherwise stated, were graded using the NPUAP/EPUAP/PPPIA (2014) grading scheme.

Recommendations not originating from existing guidelines were formulated by the GRG, based on evidence derived from PICO searches. The process used for grading the evidence throughout this guideline (except the pressure ulcer section) is as follows:

Level of Evidence	Source of the Evidence
A	Data derived from multiple randomised clinical trials or meta-analysis.
B	Data derived from a single randomised clinical trial or large non-randomised studies.
C	Recommendation comes directly from an existing guideline
D	Consensus of expert opinion and/or small studies, retrospective studies, registries.

This grading system was devised by members of the GRG, and recommendations graded using this system will be denoted as "HSE Recommendation Evidence Grade: A, B, C or D".

2.5 Summary of the Evidence

Using a systematic approach to searching, screening and appraisal, this review has identified a number of evidence based recommendations for wound care management, adapted to reflect care in the Irish healthcare setting.

The findings of this review should be viewed alongside the following limitation. Inclusion of studies in English language only potentially limits the scope of our search and we cannot exclude the possibility that we have missed some literature. This limitation is somewhat offset however, by the use of explicit inclusion criteria, PICOs, and a broad search strategy including guideline databases.

2.5.1 Summary of Wound Assessment and Management Recommendations

A summary of the Wound Assessment and Management Recommendations is not included as it was considered that part A identifies each recommendation clearly and comprehensively in each category.

2.6 Resources

A budget impact analysis was not undertaken however the resources required to implement the guideline recommendations have been considered. This revised guideline (2018) is an update of previous national guidelines published in 2009. The recommendations update current practice and include a limited number of changes that might result in an increase in resource consumption.

The main costs for the implementation of this guideline are those associated with structured training for clinical staff. It is critical that clinical staff who care for patients with wounds, have the knowledge and training to treat these patients appropriately.

This guideline is aimed at reducing the development of wounds and a reduction in the time for wounds to heal with consequent cost savings and improved quality of life for the individual. The general manager, or equivalent, of every health service provider should take corporate responsibility for providing adequate resources for training for those involved in wound care.

2.7 Outline of recommendations

Please see part A of this document for recommendations regarding the assessment and management of wounds.

3.0 GOVERNANCE AND APPROVAL

3.1 Governance

The Director of the Office of Nursing and Midwifery Services and the National Director of Clinical Strategy and Programmes commissioned this project. The Project Lead (who reports to the Director of the Office of Nursing and Midwifery Services) coordinated and administered the process.

A multidisciplinary project team undertook the guideline development process and the GRG was chaired by the Project Lead. Membership of the GRG included clinicians from across disciplines representing a range of clinical settings and from Higher Education Institutes. Consultation with chairs of each National Clinical Care Programmes and other national stakeholders was undertaken.

Details of the governance arrangements, the GRG members and each of the guideline Work Stream Group members are available in appendix XIV.

The Work streams included:

- General Wound Care
- Diabetic Foot Ulcers
- Pressure Ulcers
- Leg Ulcers
- Palliative Wound Care
- Education

When necessary, wider consultation was undertaken with topic specific experts to ensure that all available evidence was included. In the case of nutrition, an expert group of dietitians formed a subgroup to inform the nutritional recommendations of the guidelines. Final approval was sought and issued from the sponsors of the project.

3.2 Method for assessing the guideline as per the HSE national framework for developing PPPGs

The Policies, Procedures, Protocols and Guidelines Checklist was reviewed in conjunction with the final revised guideline to ensure compliance with the standards outlined in the "HSE National Framework for developing Policies, Procedures, Protocols and Guidelines (PPPGs) 2016".

3.2.1 National Stakeholder and International Expert Review

National and international expert peer review of the guideline was completed in June/July 2017. Reviewers were requested to comment on the presentation, process of development, robustness of the search, comprehensiveness of the evidence used, content of the recommendations and implementation. Feedback was submitted with supporting evidence on a form provided. All feedback received was reviewed by GRG and incorporated, as appropriate, into the final document. A log was maintained of all submissions and amendments from the national and international expert review process.

3.3 Copyright/Permission Sought

Copyright and permissions were sought from the organisations or authors of texts/graphics included in this guideline, where necessary. Refer to appendix XIX for a list of permissions/copyright sought.

3.4 Approval and Sign Off

The completed HSE National Wound Management Guidelines 2018 was submitted for approval to the Director of the Office of Nursing and Midwifery Services and the National Director of Clinical Strategy and Programmes. This was accompanied by the signed PPPG Checklist (refer to appendix XX) to confirm that all the required stages in the revision of the guideline had been completed and met the "HSE National Framework for developing Policies, Procedures, Protocols and Guidelines (PPPGs) 2016". The guideline was approved in early 2018.

4.0 COMMUNICATION AND DISSEMINATION

4.1 Communication and Dissemination Plan

It is important that the guideline is disseminated as soon as it has been completed. This approach ensured that it can be implemented immediately to support clinicians.

The Communication and Dissemination Plan will be implemented to achieve maximum circulation to inform all stakeholders that this guideline supersedes all previous wound management guidelines. The following activities will be undertaken by the HSE to ensure all relevant stakeholders are informed of the updated guidelines:

- Utilise the master list of all relevant stakeholders
- All relevant stakeholders to receive a copy of the guideline (in so far as is possible)
- Use of communication links including healthcare organisations, professional bodies and educational groups
- The identification of local champions to promote the new guideline
- Upload the policy to relevant webpage
- Dissemination via wound care and special interest organisations

5.0 IMPLEMENTATION

5.1 Implementation of the National Wound Management Guideline 2018

Implementation of the guideline will follow communication and dissemination.

5.1.1 Barriers and facilitators to implementation

There are some barriers that will impact on the full implementation of the guideline. It is recommended that each local clinical setting to which this guidelines applies should determine what resources are necessary for its implementation. The implementation of the guideline can be facilitated by ensuring that all clinicians understand and appreciate that the guideline contributes to the quality and safety of patient care.

5.2 Education

It is recommended that each local clinical setting will identify the educational needs that are necessary to implement this guideline in practice. The level of education may vary from in-service, continuing professional development to stand alone modules or post-graduate education programmes.

5.3 Responsibility for Implementation

All stakeholders involved in wound management have a responsibility for the implementation of this guideline.

5.3.1 Organisational Responsibility

The corporate responsibility for the implementation of this guideline in each local health service provider lies with the CEO, General Manager, Clinical Director and the Director of Nursing and/or Midwifery. Each member of the multidisciplinary team is responsible for the implementation of the guideline recommendations relevant to their discipline.

5.4 Roles and Responsibilities

Senior managers:

- Assign personnel with responsibility, accountability and autonomy to implement the guideline
- Ensure local policies and procedures are in place to support its implementation
- Facilitate education to all relevant clinical staff to ensure they have the knowledge and skills to implement the guideline
- Monitor the implementation of this guideline
- Ensure audit processes are in place

Heads of department:

- Ensure all relevant staff members are aware of this guideline
- Ensure staff are supported to undertake education programmes and related training as appropriate

All clinical staff:

All clinical staff should comply with this Guideline and related policies, procedures and protocols. Clinical staff should adhere to their professional scope of practice guidelines and maintain competency. In using this guideline clinicians must be aware of the role of appropriate delegation. Refer to appendix XXI for a copy the signature sheet. This should be signed to record that all clinicians have read, understood and agree to adhere to this guideline.

6.0 MONITORING, AUDIT AND EVALUATION

6.1 The Plan

It is anticipated that these guidelines will promote and enhance evidence based practice in wound care in Ireland. This guideline positively impacts on patient care, it is important that it is audited to support continuous quality improvement in relation to its implementation. The audit process should be undertaken from a multidisciplinary perspective.

6.1.1 Monitoring

The CEO, General Manager, Clinical Director and Director of Nursing and/or Midwifery in each local health service provider have corporate responsibility for monitoring the implementation of this guideline. The multidisciplinary team should monitor the implementation of the recommendations in practice.

All clinicians with responsibility for the care of patients who are at risk of developing wounds or who have wounds should:

- Adhere to their professional code of conduct and scope of practice
- Utilise this guideline and any related procedures or protocols
- Maintain their competency for the management and treatment of patients with wounds

6.1.2 Audit

Audit using key performance indicators should be undertaken to provide evidence to support continuous quality improvement.

6.1.3 Evaluation

Evaluation of the effectiveness and associated costs of the guideline should be undertaken locally to support its implementation and sustainability.

7.0 REVISION/UPDATE

7.1 Procedure for Revising the Guideline

The HSE National Wound Management Guideline 2018 will be reviewed on a 3-yearly basis and updated to incorporate any relevant new national and international evidence.

7.2 New evidence

As new evidence emerges that requires change in practice a surveillance of the literature will be undertaken so that the guideline will maintain its relevance and currency.

7.3 Version control

The original “National best practice and evidence based guidelines for wound management” were issued in 2009. Therefore the revised “HSE National Wound Management Guidelines 2018” is the second version and will be due for revision in June 2020. The guideline will be available on the HSE website.

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9.0 APPENDICES

Appendix I: Epidemiology of Wounds

1. Burden of wounds in the Irish Healthcare Setting

There is no actual figure pertaining to the financial burden of wound care to the HSE; however, it is estimated that the total annual healthcare cost of wound care is €788.5 million, with the cost per patient in the region of €3,850 (Gillespie et al., 2016). It is estimated that approximately 68% of community nurses time is spent on wound care (Moore and Cowman, 2005, McDermott-Scales et al., 2009, Skerritt and Moore, 2014). A Danish study (Gottrup et al., 2013) found 33% of hospital inpatients had a wound. A cost analysis found total annual costs of wound treatment, including hospitalisation, was approximately 1.6–1.8% for the hospitals and 1.5–2.4% for community based care. In the United Kingdom (Drew et al., 2007) found that between 2005-2006 the total annual cost of chronic wound treatment for Hull and East Yorkshire National Health Service (NHS) an estimated £15m–£18m. This equates to about 2–3% of the total local healthcare budget. The same study found treating chronic wounds required the equivalent of 88·5 full-time nurses and 87 hospital beds with the wound-attributable inpatient cost in the region of 19,000–31,000 bed days per annum. Another UK survey (Vowden et al., 2009) reported a prevalence of 3.55 patients with wounds per 1000 population across all health-care settings. Based on this, the attributable cost of wound care (based on 2006- 2007 prices) was £9.89 million: £2.03 million per 100,000 population, or 1.44% of the local health-care budget. Costs included £1.69 million spent on dressings, 45.4 full-time nurses (valued at £3.076 million) and 60–61 acute hospital beds (valued at £5.13 million). Guest et al. (2015) found that the management of wounds and associated comorbidities costs the NHS £5.3 billion per annum. Overall the care of wounds and associated co-morbidities required 18.6 million practice nurse visits, 10.9 million community nurse visits, 7.7 million GP visits and 3.4 million hospital outpatient visits.

2. Cost per Wound Type

Venous leg ulcers (VLUs) are estimated to cost between €2,500 and €10,800 per care episode (Posnett et al., 2009). In addition, the negative impact on quality of life for these patients is significant and multifaceted (Kelechi et al. 2015). In the US, it is estimated that the cost of treating VLUs is in the region of $2.5 billion per year (Simka and Majewski 2003), and in the UK between £300- £600 million per year (Nelzen 2000). Most Western countries spend roughly 1% of the national health budget on VLU treatment (American Venous Forum 2014). According to UK data costs, diabetes treatment consumes 10% of the NHS budget with roughly 80% spent on the management of complications such as diabetic foot (Diabetes UK, 2014). Findings from an Irish study (CODEIRE) suggest the treatment of diabetes accounts for 6.4% of annual Irish health expenditure (Nolan et al., 2006). In 2015, the International Diabetes Federation estimated that the cost of care per person with diabetes in Ireland was roughly $5,732.4. A study by Smith et al., (2004) found that the annual cost of treating DFUs in Ireland was €704, 000, equating to €23,500 per patient.

3. Wound Prevalence

Wound prevalence varies greatly between clinical settings and from country to country. An Irish study by (O'Brien et al., 2016) found the point prevalence of wounds was 3.7%, with surgical wounds being the most prevalent (43%). Treatment of wounds was carried out in a number of different clinical settings, with the majority of patients (60%) managed in an acute setting. In congruence with international findings, the most common wound type was leg ulceration (19%) followed by pressure ulcers (10%) and diabetic foot ulceration (5%). Other wounds e.g. pilonidal sinus accounted for the remaining 12% of reported wounds. This study found the mean duration of wounds was 4-6weeks. However this varied greatly, from less than 1 week to up to 5 years. Irish studies have found that wound care accounts for 5% of the active community nursing caseload. A study by (Skerritt and Moore, 2014) found 60% of the sample had leg ulcers, 22% had pressure ulcers, 16% had an acute wound (surgical or traumatic wounds), 1% had a diabetic foot wound and a further 1% had wounds of other aetiologies. The mean duration of wounds was 5.41 months. A total of 18% of wounds were identified as infected.

Hospital In-Patient Enquiry (HIPE) data for 2014 shows that upon discharge from acute hospitals, disorders of the skin and subcutaneous tissue accounted for 62,070 principal diagnosis and cases involving cutaneous abscess, furuncle, carbuncle and cellulitis accounted for 7,374 of all diagnoses (HPO, 2015). In total there were 110,700 cases involving disorders of the skin and subcutaneous tissue, accounting for 7% of all discharges, with 5.3 days, the mean length of stay for these cases. There were 110,412 dermatological and plastic procedures performed in acute hospitals in 2014, 42,239 cases of which involved excision of lesion(s) of skin and subcutaneous tissue; 5,285 cases of debridement of skin and subcutaneous tissue and 1,924 cases of skin grafts were registered. In 2014, HIPE ranked operations of the skin and subcutaneous tissue 5th out of the top 20 principal procedures for Day patients representing 36,279 cases. Dressing of other wounds ranked 18th, accounting for 5,985 cases. Excisions of lesion (s) of the skin and subcutaneous tissue ranked 13th out of the top 20 principal procedures in elective day patient cases with a total of 965 registered cases. Cellulitis was ranked 12th out of the top 20 principal diagnoses in emergency in-patient cases. The average length-of-stay for all patients with a disease of the skin and subcutaneous tissue was 4.5 days, but this increased to 6.7 days in those over 65 years of age (HPO, 2015).

Appendix II: The Wound Healing Process

A wound is defined as a breach in the skin. Wound healing consists of four distinct yet overlapping stages: homeostasis, inflammation, proliferation, and tissue remodelling (Witte and Barbul, 1997). Wounds may be traumatic or surgical in origin or they may be caused or exacerbated by medical conditions such as diabetes, hypertension, vascular and inflammatory disorders (Morton and Phillips, 2016). Wounds may be classified as either acute or chronic. Acute wounds progress through the healing phases in an organised, progressive and timely manner (Powers et al., 2016). Examples of acute wounds include those which are traumatic or surgically induced (Wilhelm et al., 2017). Chronic wounds, on the other hand, fail to progress through the normal progressive sequence of tissue repair or fail to resume normal cellular organisation or function. This protracted course of repair may arise due to the presence of co-morbidities, prolonged inflammation, infection, malnutrition or impaired immune response (Guo and DiPietro, 2010). Examples of chronic wounds include leg ulcers, diabetic foot ulcers and pressure ulcers.

The ability of the body to repair or heal itself following injury is a natural restorative response and a crucial survival mechanism. The type and rate of wound healing will be influenced by the nature and extent of the injury, the location of the injury, the capacity of the skin in that area to repair itself, and the characteristics of patient (Bryant and Nix, 2015). Wound healing refers to the ability of the skin to repair itself, and this is achieved through two mechanisms (Flanagan, 2013):

- *Tissue Regeneration* which replaces damaged tissue with similar tissue. In a superficial injury in which the stratum basale remains intact, the epidermis regenerates cells of equivalent type and function.
- *Tissue Repair* is a more complex healing process which occurs when the dermis is injured, and lost tissue is replaced by connective tissue which does not have the same degree of functionality as the original tissue.

The mechanism by which a wound will heal can be categorised into:

Primary closure (primary intention): the edges of the wound are approximated or brought together by mechanical means, such as glue, strips, sutures or staples. This mechanism is seen in wounds with little tissue loss, for example, surgical wounds, and results in minimal scarring (Flanagan, 2013; Peate and Glencross, 2015).

Delayed primary closure: wound closure is delayed for 3-6 days after which it is closed surgically with sutures or staples. Delayed closure may be used if, for example, a wound is contaminated, is more than 24 hours old, or has impaired perfusion (Alexander et al., 2011), which would compromise healing if the wound was closed by primary intention.

Secondary closure (secondary intention): Wounds with extensive tissue loss for example, trauma, burns or ulcers, are unsuitable for primary closure. These wounds are left 'open' to heal by granulation, contraction and epithelialisation of the wound (Enoch and Leaper, 2008).

In addition, surgical procedures may be used to promote healing (Herndon, 2012):

Skin Graft: excision of a partial or full thickness segment of healthy epidermis and dermis, without a blood supply, which is then transplanted on to a wound to enhance healing and reduce the risk of infection.

Flap: surgical excision of skin and its underlying structures, with blood supply intact, which is then used to repair or reconstruct a defect caused by tissue loss.

Objectives of Wound Healing:

Wound healing is a dynamic process which is typically characterised by four distinct but overlapping phases, with the process starting immediately following an injury: haemostasis, inflammation, proliferation and maturation.

In the treatment of wounds, the clinician should endeavour to facilitate the following objectives of wound healing:

1. The wound should be allowed to heal in a moist wound environment, unless the clinical goal is to maintain a dry wound bed e.g. ischaemic foot
2. To address the issues observed in the assessment process
3. To promote wound healing

In order to accurately assess a wound and its progress along the healing trajectory, Clinicians must have an understanding of the physiology of these stages of healing, and the appearance and characteristics of the wound at each stage (Bryant and Nix, 2016).

Appendix III: Wound Assessment Tool Examples

1. Cork University Hospital Group Wound Assessment Tool

Stationary No. 560

Cork University Hospital Group

OPEN WOUND RECORD

Wound management must be conducted as an integral part of the patients plan of care

Where more than one wound present assess and document each wound individually in separate column / chart

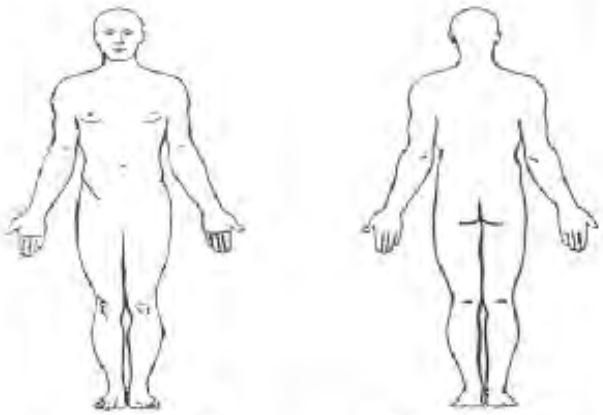
Affix patient identification label	Aetiology of Wound(s): Origin/Cause, Type, Location, Duration
MRN: _____	
Name: _____	
DOB: _____	
Consultant:: _____	
Clinical Area: _____	
Allergies:	

Blood Results:

Date			
Total Proteins (62– 82g/L)			
Albumin (36 – 44g/L)			
Haemoglobin (14.0 – 17.4g/dL)			

Identify Specific Nutritional Interventions

Please mark location(s) of wounds by shading



Right Left Left Right

Please tick (with ✓) factors present that may be contributing to a delay in wound healing with this patient

- ❒ Malnutrition
- ❒ Obesity
- ❒ Social Isolation
- ❒ Incontinence
- ❒ Difficulty with Hygiene
- ❒ Medication (e.g. steroids or NSAIDS)
- ❒ Diabetes / Type
- ❒ CVA/ TIA
- ❒ Peripheral Vascular Disease
- ❒ Heart Disease
- ❒ Anaemia (if less than 10.0g/dL)
- ❒ Hypertension / Hypotension
- ❒ Limited Mobility
- ❒ Systemic Infection
- ❒ Smoking
- ❒ Arthritis / Type
- ❒ Other

Please Specify_____

Please tick (with ✓) if: Wound has been photographed ❒ Traced ❒

Dated photographs are stored in: Medical records ❒ Nursing Documentation ❒

All patients must be assessed for pain (using appropriate pain scale)

Additional Comment:

Please refer to appropriate careplan e.g Wound Care Plan (form no. 8.17) or Burns care plan (form no. 8.43) in Nursing Documentation regarding Interventions.

Nursing Student Signature:	Date:
Registered Nurse Signature:	Date:

*Refer to HSE (2009) National best practice and evidence based guidelines for wound management and to CUH Wound Formulary / Glossary 2010 (Stationery no. 370)

1.

OPEN WOUND RECORD CHART: ONGOING ASSESSMENT Where more than one wound present assess and document each wound individually in a separate column/chart			
DATE OF DRESSING			
LOCATION OF WOUND			
TYPE OF DRESSING(S) REMOVED			
EXUDATE Dressing: Moist, Wet, Soaked TNPT canister: Dry, Moderate, Full Type: Serous, Sanguinous, Serosanguinous, Purulent			
ODOUR Normal / Offensive at dressing change only / Continuous			
TISSUE TYPE (Estimate %) Necrosis, Slough, Granulation, Epithelialisation, Overgranulation			
WOUND SIZE (Measure, trace and or photograph every 10 days) Maximum Length (cm) Maximum Breadth (cm) Total area in cm² Depth Undermining at edge in cm			
TISSUE LAYERS ERODED (Identify) Epidermis, Dermis, Subcutaneous Tissue, Muscle, Bone			
PHASE OF HEALING (Phases may overlap) Haemostasis, Acute Inflammatory, Proliferative, Remodelling, Chronic Inflammatory			
SURROUNDING SKIN (More than one term may apply) Normal, Fragile, Erythema, Blistering, Macerated, Eczema wet / dry, Dermatitis Cellulitic			
ACTION e.g. Protection, Moisturising			
INFECTION (Complete only if appropriate) Pain, Increased Local Temperature, Exudate increase, Tender, Deep red granulation tissue, Easily torn, Bleeds, Pocketing, Bridging Cellulitic			
ACTION e.g., Exudate sample, Swab sent, Medical Review			
PAIN ASSESSMENT Pain score 0 – 10 (as per CUH Policy)			
PAIN MANAGEMENT e.g. pharmacological or nonpharmacological			
TREATMENT OBJECTIVE (Choose one or more) Moist Wound Healing, Absorption, Debridement, Protection, Decrease bacterial load, Reverse overgranulation			
CLEANSING SOLUTION			
***DRESSING(S) APPLIED** Specify type e.g. non-adhesive			
SUGGESTED DATE OF NEXT DRESSING CHANGE			
REFERRAL (Specify)			
COMMENT			
Nursing Student Signature:			
Registered Nurse's Signature:			

*Refer to HSE (2009) National best practice and evidence based guidelines for wound management and to CUH Wound Formulary | Glossary 2010 (Stationery no. 370)

2.Tallaght Hospital (AMNCH) Wound Assessment Tool

Tallaght Hospital

Wound Assessment and Management Care Plan

Surname:	
Forenames:	
Address:	Addressograph
Healthcare Record Number:	
Date of Birth:	

Wound Assessment Chart										
To be completed at each dressing change /measure a minimum of weekly										
Location										
Date										
Wound Dimensions										
Max. length mm.										
Max. width mm.										
Depth mm.										
Undermining/Tunneling mm.										
Wound Bed	**Estimate in %**									
Necrotic (black)										
Sloughy (yellow)										
Granulating (red)										
Epithelialising (pink)										
Other										
Exudate—Content: High/Moderate/Low										
Odour:										
Condition of surrounding skin										
Intact										
Blisters										
Erythema										
Macerated/Excoriated										
Eczema										
Odema										
Other										
Pain in wound:	**VRS (1-10) = Verbal Rating Scale**									
Intermittent										
Continuous										
At Dressing										
Infection: Yes /No										
Wound swab taken										
Initials										
Title										
Nurse PIN										

Tallaght Hospital

Wound Assessment and Management Care Plan

Surname:	
Forenames:	
Address:	Addressograph
Healthcare Record Number:	
Date of Birth:	

	Yes	No		
In-Patient:	☐	☐	**In-patient Care Plan No.:**	_____
Outpatient:	☐	☐		

Initial Assessment

Type of Wound: _____

Duration of Wound: _____

Location of Wound: _____

Nutrition: Malnutrition Universal Screening Tool (MUST) Score: _____

Patient Factors which may delay healing (Tick if present)

Please note this is not a definitive list

Autoimmune Diseases	☐	Malabsorption Syndrome	☐	**Drugs**	
Diabetes Mellitus	☐	Wound Infection Present	☐	Steroids	☐
Cardiac Disease	☐	Foreign Body	☐	NSAID(s)	☐
Anaemia	☐	Radiotherapy	☐	Cytotoxics	☐
Reduced Tissue Perfusion	☐	Immobility	☐	Immunosuppresents	☐
Chronic Breathing Difficulties	☐	Smoker	☐	Anticoagulants	☐
Other	☐	_____			

Allergies/Intolerances: _____

_____

Date/Time	Signature	Title	Nurse PIN
___/___/_____	_____	_____	_____
_____:_____	_____	_____	_____

Discharge Plan		Yes	No		Yes	No
Wound Outcome:	Healed	☐	☐			
Discharge Follow Up:	PHN	☐	☐	Wound Management Clinic	☐	☐
	OPD	☐	☐	GP	☐	☐
	None	☐	☐	Other: _____	☐	☐

Date	Signature	Title	Nurse PIN
___/___/_____	_____	_____	_____
	_____	_____	_____

Tallaght Hospital

Wound Assessment and Management Care Plan

Surname:

Forenames:

Address: Addressograph

Healthcare Record Number:

Date of Birth:

Date	Time	Nursing Notes	Student Nurse Signature/ Nurse PIN	Registered Nurse Signature/ Title/Nurse PIN

PILOT

3. Paediatric Wound Assessment Tool

Temple Street

CHILDREN'S WOUND ASSESSMENT TOOL *(use a separate tool for each individual wound)*

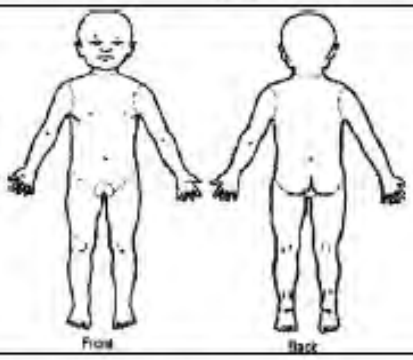
Name: ..... HCR No: .....

Address: ..... DOB: ___/___/_____

..... Gender: M / F

Ward / Dept: ..... Consultant: .....

Please mark the location of the wound



Please indicate type of wound (using list opposite)

Wound : _____

Factors which may delay wound healing

Please tick ✓ all that apply and refer to relevant careplan

Reduced mobility ☐ Poor Nutrition ☐ Anaemia ☐ Multiple trauma ☐

Incontinence *(inappropriate for age)* ☐

Other *(please specify)* ☐ .....

Weight: _____ kgs Height: _____ cm Date measured ___/___/_____

Any allergies or sensitivities (wound specific): Yes ☐ No ☐

.....

Multidisciplinary Team Referrals *(Please indicate date sent)*:

Dietician: ___/___/____ Infectious Diseases: ___/___/____

Occupational Therapy: ___/___/____ Others: ..... ___/___/____

Physiotherapy: ___/___/____ ..... ___/___/____

Photograph(s) taken: Yes ☐ No ☐

Wound Swab performed: Yes ☐ N/A ☐ *(following initial assessment)*

Types of wounds (tick ✓ appropriate wound)

☐ Surgical ☐ Traumatic wound ☐ Pressure Ulcer (Grade _____)

☐ Lesion *(please specify)* _____

☐ Burn / Scald please indicate if: superficial; superficial partial thickness; partial thickness; full thickness; mixed thickness.

☐ Other *(please specify)* _____

Initial Wound Assessment						Plan			
Pain score (1-10)	Wound Dimensions	Wound Tissue Type	Exudate	Peri-wound skin	Signs of infection	Primary Dressing	Secondary Dressing	Plan Frequency of dressing change.	Sign & Grade & NMBI PIN
	_____cm _____cm _____cm	☐ Epithelialising (pink) ☐ Hypergranulation (bright red) ☐ Sloughy (yellow /green) ☐ Necrotic (black) ☐ Granulating (red)	☐ None /low ☐ Moderate ☐ High	☐ Healthy/intact ☐ Dry/scaling ☐ Erythema ☐ Fragile ☐ Oedematous ☐ Macerated	☐ Increased pain ☐ Increased exudate ☐ Increased odour ☐ Heat ☐ Pyrexia Other				
Drain: Yes ☐ No ☐ Type _____ To be removed __/__/__ Sutures: Yes ☐ No ☐ To be removed __/__/__									

Assessment Date: ___ / ____ / 20___ **Time:** ___ : ___ **Signature of Nurse:** _____ **Grade:** _____ **PIN:** _____

Ward / Dept _____ **Co-signature** *(if required)*: _____ **Grade:** _____ **PIN:** _____

Subsequent changes to plan of care

Please complete this section if there is a change in the type or frequency of dressing change.

Date & Time	Rationale for change to the plan of care or other relevant information	Primary Dressing	Secondary Dressing	Plan Frequency of dressing change.	SIGN & NMBI PIN
	.....				
	.....				
	.....				
	.....				

CTIG © 2016

Name _____
HCR No. _____ DOB _____

Wound Assessment on Subsequent Dressing Change

(Please use separate evaluation sheet to document the nursing care provided between dressing changes)

Date							
	Please complete / tick ✓ if applicable. N/A if non-applicable						
Pain score (1-10) *during procedure*							
Analgesia administered							
Wound dimensions							
Length (cm) x Width (cm)	cm x cm	cm x cm	cm x cm	cm x cm	cm x cm	cm x cm	cm x cm
Depth (mm)	cm	cm	cm	cm	cm	cm	cm
Is wound tracking							
Is wound undermining							
Tissue type on wound bed							
Granulating (Red)							
Hypergranulating (Bright Red)							
Epithelialising (Pink)							
Sloughy (Yellow/Green)							
Necrotic (Black)							
Underlying structures visible							
Wound exudate levels / type							
None							
Low (L) / Moderate (M) / High (H)							
Colour of exudate							
Peri-wound skin							
Healthy/intact							
Dry/scaling							
Erythema							
Excoriated							
Oedematous							
Macerated							
Other							
Signs of Infection – 1 or more of these signs may indicate infection							
Heat / Increasing pain / Increasing exudate / Increasing odour / Friable granulation tissue / Other							
Sutures removed (date)							
Drain removed _____							
Swabs performed / requested							
Photographs taken							
Comment *e.g. give details re condition of the wound, improving, deteriorating. If change of plan required, complete section overleaf*							
Signature & Grade & NMBI PIN							
Date / Time							

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Appendix IV: Wound Exudate Descriptor Table
(Adapted from WUWHS, 2007; Wounds UK, 2013)

Type	Consistency	Colour	Significance
Serous	Thin, watery	Clear, amber	Often considered normal, but increased volume may indicate infection (e.g. Staphylococcus Aureus)
Fibrinous	Thin, watery	Cloudy	May indicate presence of fibrin strands
Serosanguinous	Thin, slightly thicker than water	Clear, pink	Presence of red blood cells indicates capillary damage (e.g. post-surgery or traumatic dressing removal)
Sanguineous	Thin, watery	Reddish	Low-protein content due to venous or congestive cardiac disease, malnutrition. Other causes include urinary, lymphatic or joint space fistula.
Seropurulent	Viscous, sticky	Yellow or tan, cloudy	Bacterial infection Presence of liquefying necrotic tissue or material from enteric or urinary fistula.
Purulent	Viscous, sticky	Opaque, milky, yellow or brown, sometimes green	
Haemopurulent	Viscous	Reddish, milky	Established Infection May contain neutrophils, dying bacteria
Haemorrhagic	Viscous	Dark Red	Bacterial Infection Capillary Damage indicative of trauma

Appendix V: Wound Infection

1. Wound Infection Management Algorithm (IWII, 2016)

Effective Wound Infection Management

Optimise Individual Host Response	Reduce Wound Microbial Load	Promote Environmental and General Measures
Optimise management of comorbidities e.g. diabetes, tissue perfusion/oxygenation	Prevent cross infection by implementing universal precautions and aseptic technique	Perform wound care in a clean environment
Minimise or eliminate risk factors that increase infection risk where feasible	Facilitate wound drainage	Determine that the appropriate aseptic technique required is based on risk assessment of the patient, the wound and the environment
Optimise nutritional status and hydration	Ensure peri-wound hygiene and protection	Store equipment and supplies appropriately
and manage other anatomical sites of infection e.g. urinary tract, chest	Manage wound exudate	Provide education for the individual and their caregivers
Treat systemic symptoms e.g. pain, pyrexia	Optimise the wound bed: o Remove necrotic tissue, debris, foreign bodies, wound dressing remnants and slough o Disrupt biofilm by debriding o Cleanse the wound with each dressing change	Regularly review local policies and procedures
Promote psychosocial support	Use appropriate dressings to manage exudate – a dressing containing an antimicrobial may be considered	
Provide appropriate systemic antimicrobial therapy	If deemed necessary consider an appropriate topical antiseptic for a short period of time e.g. 2 weeks	
Ensure the individual is engaged in the development of a personalised management plan		
Promote education by the interdisciplinary wound management team to the individual and their caregivers		
Regular Re – Assessment		
Diagnostic interpretation requires holistic knowledge of the individual and their wound		
Evaluate interventions based on efficacy in resolving signs and symptoms of wound infection and the overall condition of the individual. Consider the following: o Has the individual's pain decreased? o Has exudate decreased? o Has malodour resolved? o Has erythema and oedema decreased? o Is there a reduction in non-viable tissue? o Is the wound reducing in size and/or depth?		
Monitor condition of the peri-wound, particularly in heavily exuding wounds		
If there is limited or no improvement in signs and symptoms of wound infection, reassess the individual and their wound and adjust the management plan		
Consider if further investigations are required		
Consider referring the individual to specialised services e.g. wound clinic		
Document wound assessments e.g. serial digital photography		

2. The Levine Technique

Levine Technique (1976)

The best technique for swabbing wounds has been identified and validated as the Levine Technique (Cooper 2010). The method most cited and underwritten by microbiologists in relation to wound infection are the steps as outlined by Levine (1976).

How to Take a Wound Swab

1. When a swab is indicated, the patient should be given a concise explanation of the need for microbiological investigation and what the procedure involves, for example, that swabs are mainly used to recover species from the surface layers rather than from the deep tissues of a wound.

2. Before a representative sample is collected, any contaminating materials such as slough, necrotic tissue, exudate and dressing residue should be removed by cleansing the wound with tap water, sterile saline or debridement.

3. Sterile swabs with cotton or rayon tips are usually used. If the wound is moist a swab can be used straight from the packaging – if the wound is dry, then the swab tip should be moistened with sterile saline to increase the chances of recovering organisms from the site. Swabs with a transport medium that incorporates charcoal enhance the survival of fastidious organisms

4. Care should be taken to ensure that the swab only comes into contact with the wound surface.

5. The swab should be moved across the wound surface in a zig-zag motion, at the same time as being rotated between the fingers. Downward pressure to release fluid from the wound surface has been advocated, but this may be painful for the patient.

6. A representative area of the wound should be sampled. If the wound is large, it may not be feasible to cover the entire surface, but at least 1cm^2 should be sampled and material from both the wound bed and wound margin should be collected. If pus is present, the clinician should ensure that a sample is sent to the laboratory.

7. Immediately following collection, the swab should be returned to its container (placed into the transport medium) and accurately labelled

8. Any supporting documentation for the laboratory should immediately be completed and a note included in the patient's records. It is important to provide information to the laboratory staff that will aid their use of the standard operating protocol, such as underlying co-morbidities, the patient's age, ongoing treatment and wound location.[5]

9. Swabs must be transferred to the laboratory as quickly as possible and ideally processed within four hours of collection.

10. The laboratory report should list the potential pathogens.

Appendix VI:

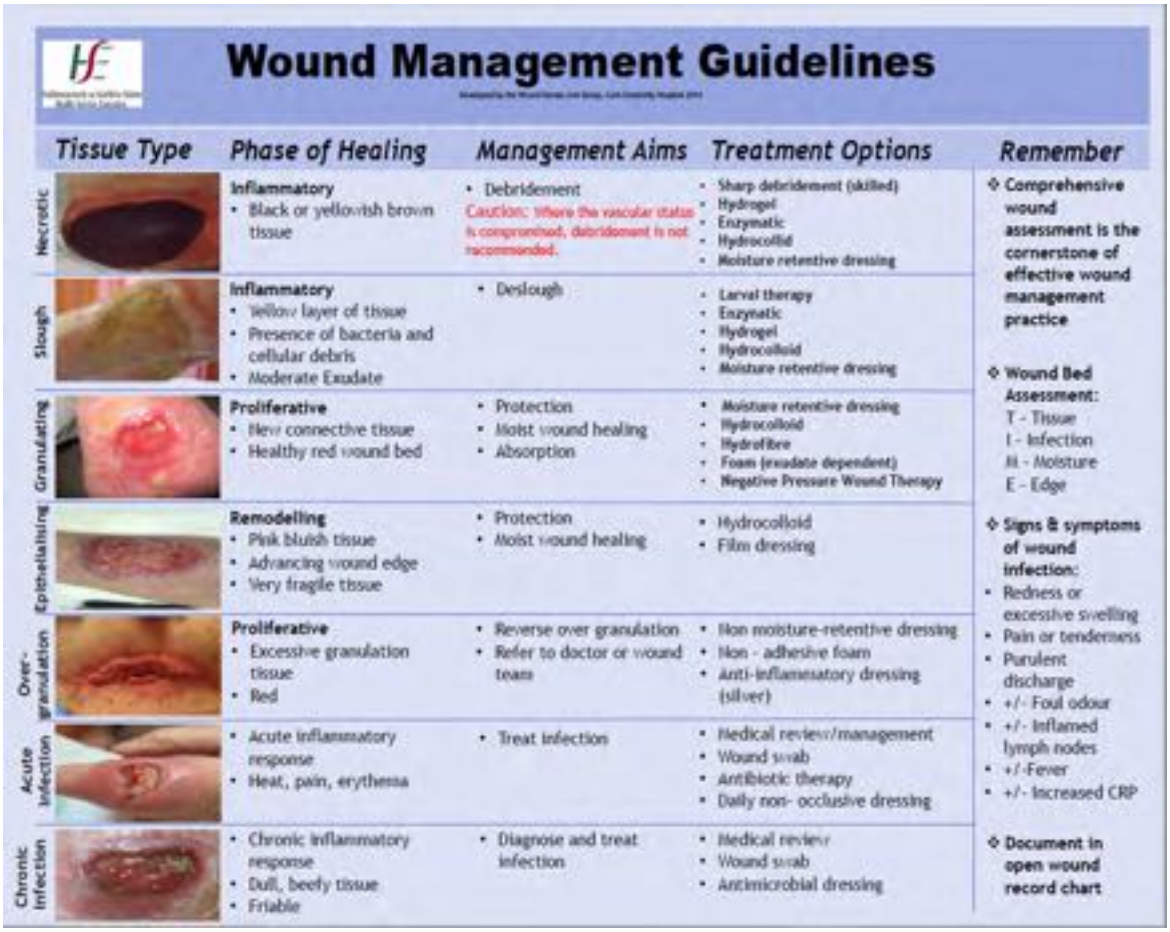
Aseptic Non-Touch Technique (ANTT©) Guide

1. Simple Wound Care

2 .Complex Wound Care

Appendix VII: Dressing Selection Guides

1. **Dressing Selection for Adults**



Wound Management Guidelines

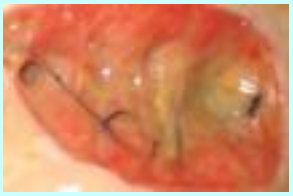
Tissue Type	Phase of Healing	Management Aims	Treatment Options	Remember
Necrotic	**Inflammatory** • Black or yellowish brown tissue	• Debridement Caution: Where the vascular status is compromised, debridement is not recommended.	• Sharp debridement (skilled) • Hydrogel • Enzymatic • Hydrocolloid • Moisture retentive dressing	◇ **Comprehensive wound assessment is the cornerstone of effective wound management practice**
Slough	**Inflammatory** • Yellow layer of tissue • Presence of bacteria and cellular debris • Moderate Exudate	• Deslough	• Larval therapy • Enzymatic • Hydrogel • Hydrocolloid • Moisture retentive dressing	◇ **Wound Bed Assessment:** T - Tissue I - Infection M - Moisture E - Edge
Granulating	**Proliferative** • New connective tissue • Healthy red wound bed	• Protection • Moist wound healing • Absorption	• Moisture retentive dressing • Hydrocolloid • Hydrofibre • Foam (exudate dependent) • Negative Pressure Wound Therapy	◇ **Signs & symptoms of wound infection:** • Redness or excessive swelling • Pain or tenderness • Purulent discharge • +/- Foul odour • +/- Inflamed lymph nodes • +/-Fever • +/- Increased CRP
Epithelialising	**Remodelling** • Pink bluish tissue • Advancing wound edge • Very fragile tissue	• Protection • Moist wound healing	• Hydrocolloid • Film dressing	
Over-granulation	**Proliferative** • Excessive granulation tissue • Red	• Reverse over granulation • Refer to doctor or wound team	• Non moisture-retentive dressing • Non - adhesive foam • Anti-inflammatory dressing (silver)	
Acute Infection	• Acute inflammatory response • Heat, pain, erythema	• Treat infection	• Medical review/management • Wound swab • Antibiotic therapy • Daily non- occlusive dressing	
Chronic Infection	• Chronic inflammatory response • Dull, beefy tissue • Friable	• Diagnose and treat infection	• Medical review • Wound swab • Antimicrobial dressing	◇ **Document in open wound record chart**

Alert!

When vascular status is compromised debridement is contraindicated.

2. Dressing Selection for Children

Wound Classification & Dressing Selection for Children's Wound Care[1]

Wound Bed	Wound type	Wound Care Objectives	Primary Dressing Characteristics	Secondary Dressing Characteristics
Epithelialising (Pink)		Protect delicate healing tissue Promote epithelialisation Manage exudate, likely to be minimal	Low/Non-adherent dressing Extra Thin Hydrocolloid Depending on location & condition of wound, may be left exposed – if so, consider applying moisturiser	Consider All-in-One-dressing
Granulating (Red)		Maintain moist environment Protect granulating tissue Manage exudate Prevent infection	Hydrofiber Low/Non adherent dressing	Extra Thin Hydrocolloid[2] / Film Absorbent dressing ± Retention dressing
Sloughy (White / Yellow)		Wound will not heal until slough is removed Debride Manage exudate	Hydrogel (Low exudate) Hydrofiber (Moderate to high exudate)	Absorbent dressing ± Retention dressing Retention dressing
Necrotic (Black) (Non-viable tissue)		Some necrotic lesions may be left to separate spontaneously Some wounds may need debridement - then manage as Epithelialising, Granulating or Sloughy wound	These wounds may be left dry & undressed (use clinical judgement) If autolytic debridement needed: Hydrogel	Absorbent dressing ± Retention dressing
Slow healing / Chronic Wound	**If wound does not appear to be healing or there is no change in wound appearance after 1-2 weeks, consider Critical Colonisation** i.e. multiplication of bacteria causing a delay in wound healing, may be associated with an exacerbation of pain but without clinical infection and surrounding cellulitis	Reduce bacterial burden Promote healing Consider antimicrobial products under medical supervision	Antimicrobial dressing[3]	Retention dressing ± Absorbent dressing
Infected (May be red with green / yellow discharge)		Wound swab to identify organism Treat infection Manage exudate Systemic antimicrobial treatment if clinically indicated and per local policy	Antimicrobial dressing[3]	Retention dressing ± Absorbent dressing

Overgranulation (red tissue raised above epithelial margin)		Reduce overgranulated areas Manage exudate, if any	Topical (*only under medical supervision and* ***only*** *treat overgranulated areas) e.g.* Hydrocortisone 1% cream If exudates present, consider layering Hydrofibre	Foam Retention dressing
Cavity		Promote healing from base of cavity Protect granulating tissue Absorption of exudate Prevent infection Be aware, a cavity has the potential to track or tunnel	NPWT[4] (use under multidisciplinary advice) Hydrofiber	Retention dressing ± Absorbent dressing

[1]Use in conjunction with Wound Care Product Reference Guide and current HSE National Wound Management Guidelines

[2]Only use a hydrocolloid secondary dressing if low-medium exudate and if dressing can remain in situ for three days or longer. If more frequent dressing change required, consider a non-adhesive retention dressing which is easily removed without adhering to skin

[3]Antimicrobial dressings - Use antimicrobial product for up to 2 weeks with formal assessment of treatment objectives after 7 days. Assess wound at each dressing change for efficacy of treatment. A wound which fails to respond to treatment requires careful re-assessment and, where necessary, a change of antimicrobial. (Wounds UK 2010, White *et al.* 2011).

[4]NPWT = Negative Pressure Wound Therapy

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3. List of Antiseptic Agents used in Wound Dressings *(EONS, 2015)*

TOPICAL ANTIMICROBIAL AGENT	TARGET SITE/ MODE OF ACTION	RESISTANT BACTERIA FIRST ISOLATED	EXAMPLES OF SYSTEMIC TOXICITY AND ALLERGENICITY
Cadexomer iodine	Oxidation of thiol groups, Binding to DNA and Reduction of fatty acids In membranes		Renal and thyroid Dysfunction
Chlorhexidine *Please check with the policies of your country if chlorhexidine is available or if its use is allowed.*	Disruption of the bacterial Inner membrane and Coagulation of cytoplasmic Components	Proteus Mirabilis Pseudomonas sp. S. Aureus	Risk of anaphylactic Reaction to Chlorhexidine allergy
Honey (medical grade) *	Prevents cell division in Staphylococci and disrupts Outer membranes of Pseudomonas		
Iodine	Oxidation of thiol groups, Amino groups, binding to DNA and reduction of fatty Acids in membranes		Renal and thyroid Dysfunction
Octenidine	Disruption of bacterial Membranes		
Polyhexanide (polyhexamethylene Biguanide [PHMB])	Disruption of bacterial Membranes by binding to Phospholipids		Hypersensitivity rare, But possible
Povidone iodine	Oxidation of thiol groups, Binding to DNA and Reduction of fatty acids In membranes		Renal and thyroid Dysfunction Allergic reactions
Silver	Interacts with thiol groups in membrane-bound enzymes and binds to DNA to cause strand breakage	E. Coli Enterobacter cloacae P. Aeruginosa A. Baumannii	Argyria and argyrosis
Slow-release hydrogen Peroxide products (based On glucose oxidase and Lactoperoxidase)	Forms free radicals, which Oxidise thiols groups in Proteins and cause breaks in DNA strands		

** Medical-grade honey should not be mistaken for regular table honey. Medical-grade honey has been rendered free of contaminants and bacteria through gamma irradiation, in laboratory-controlled conditions. The most widely used medical-grade honey is Manuka honey. This honey comes from regions in New Zealand and Australia and has high antibacterial and anti-inflammatory properties.*

Appendix VIII: Medical Adhesive Related Skin Injury Classification (MARSI)

1. Types of MARSI (Adapted from McNichol and Bianchi, 2016)

Mechanical Skin (Epidermal) stripping	Removal of one or more layers of stratum corneum following removal of adhesive tape or dressing.	
Tension injury or blister	Injury caused by shear force as a result of distension of skin under an unyielding adhesive tape or dressing.	
Skin tear	Wound caused by shear, friction and/or blunt force resulting in separation of skin layers; can be partial or full thickness.	
Dermatitis		
Irritant contact dermatitis	Non-allergic contact dermatitis occurring as a result of a chemical irritant; a well-defined affected area correlates with the area of exposure.	

Allergic dermatitis	Cell-mediated immunologic response to a component of tape adhesive or backing; typically appears as an area of erythematous vesicular, pruritic dermatitis corresponding to the area of exposure and/or beyond.	
Other		
Maceration	Changes in the skin resulting from moisture being trapped against the skin for a prolonged period; skin appears wrinkled and white/grey in colour.	
Folliculitis	Inflammatory reaction in hair follicle caused by shaving or entrapment of bacteria; appears as small inflamed elevations of skin surrounding the hair follicle.	

2. Steps for Minimising Medical Adhesive Related Skin Injury

Practical Steps for Minimising MARSI

<table>
<tr><td colspan="2">There are four broad categories for preventing and minimising incidence of MARSI.
It is important to implement a multi-factorial MARSI prevention regimen, including a thorough assessment and identification of at risk patients, appropriate skin preparation, appropriate selection of medical adhesive, best application and removal of adhesives, to reduce incidence of MARSI.</td></tr>
<tr><td>Skin Preparation</td><td>• Remove excess hair by trimming or using clippers – no shaving
• Determine and address any causes of excess moisture – eg sweating, urine or leakage from a wound or drain
• Assess skin macerationand oedemaand initiate management for the underlying conditions
• Be sure skin is clean and dry
• Apply protective alcohol- free barrier film</td></tr>
<tr><td>Choosing appropriate medical adhesives</td><td>• Consider the anatomy over which the adhesive will be placed. For example, is the area contoured (e.g. sacrum) or flat (e.g. arm) and is there potential for the skin to stretch due to factors such as oedema, distension and movement?
• Consider the length of wear time as many adhesives bond more strongly to the skin the longer they are in contact
• Match these factors against both the risk level of the skin and the requirements for medical adhesive use
• Use the lowest level of adhesion required to secure the device or dressing and use tape with stretch where possible or needed
• Consider newer adhesive products such as silicone adhesive where adhesion is needed but the skin is at risk
*A note on silicone adhesives; although they are softer and have a lower surface tension, letting them fill gaps in skin irregularities quickly and gently, these products maybe less moisture resistant than traditional adhesives and more research is needed into their use, efficacy and prevention of skin injuries.</td></tr>
<tr><td>Adhesive Product Application</td><td>• Provide standardised staff training in adhesive product application
• Do not routinely use tackifiers
• Use sufficient, appropriate pressure to gain adhesion
• Cover adequate surface area to evenly distribute adhesion tension
• Obtain full contact, ironically, gaps will cause more tension in the adhesive area that has contact with the skin, increasing the risk of MARSI
• Tape or dressing should be long enough to extend to 1.25cms (2.5cms is preferred) beyond the dressing or the device
• Orient the tape / dressing to allow stretch (ie in the direction of expected swelling or movement)
• Apply tape/dressing without stretch without stretch or tension; replace arylate tape or reposition silicone tape if swelling/distension occurs
• Apply gentle, firm pressure after application, stroking the tape in place</td></tr>
<tr><td>Adhesive Product Removal</td><td>• Provide standardised staff training in adhesive product removal
• Remove at a low profile to the skin, gently slowly and evenly
• Consider the use of a specialised medical adhesive remover
• Removing dressings too frequently can cause unnecessary trauma to the skin and potentially delay wound healing therefore remove dressings only when there is an indication to do so (e.g. due to exudate levels)
• Remove tape/dressings slowly, keeping tape horizontal and close to the skin
• Remove in the direction of hair growth
• Support exposed skin at the peel line as tape/dressing is removed.</td></tr>
<tr><td colspan="2">Reference: Mc Nichol, 2016</td></tr>
</table>

3. Moisture Related Skin Damage Tool

Scottish Excoriation & Moisture Related Skin Damage Tool

Skin damage due to problems with moisture can present in a number of different ways. This tool aims to help you identify the cause to aid in decision making for treatments.
Moisture may be present on the skin due to incontinence (urinary and faecal), perspiration, wound exudate or other body fluids e.g. lochia, amniotic fluid.
Lesions caused by moisture alone should not be classified as pressure ulcers.

Combination Lesions:

These are lesions where a combination of pressure and moisture contribute to the tissue breakdown. They still need to be graded as pressure damage but awareness of other causes and treatments is needed.
See Pressure Ulcer Grading Tool

Incontinence Related Dermatitis (IRD)

Mild
Erythema (redness) of skin only. No broken areas present.

Moderate
Erythema (redness), with less than 50% broken skin.
Oozing and/or bleeding may be present.

Severe
Erythema (redness), with more than 50% broken skin.
Oozing and/or bleeding may be present.

Moisture Lesions:

Skin damage due to exposure to urine, faeces or other body fluids

Location
Located in peri-anal, gluteal, cleft, groin or buttock area.
Not usually over a bony prominence.

Shape
Diffuse often multiple lesions.
May be 'copy', 'mirror' or 'kissing' lesion on adjacent buttock or anal-cleft.
Linear

Edges
Diffuse irregular edges.

Necrosis
No necrosis or slough.
May develop slough if infection present.

Depth
Superficial partial thickness skin loss.
Can enlarge or deepen if infection present.

Colour
Colour of redness may not be uniform. May have pink or white surrounding skin (maceration).
Peri-anal redness may be present.

Treatment:

Prevention/Mild IRD:
Cleanse skin e.g. foam cleanser or pH balanced product. Apply Moisturiser +/or skin protectant e.g. barrier cream/film which does not affect absorbency of continence products.

Moderate-Severe IRD:
Cleanse skin e.g. foam cleanser or pH balanced product. Apply liquid/spray skin protectant, OR barrier preparation, if no improvement refer to local guidelines or seek specialist advice.

NB:
Observe for signs of skin infection, e.g. candidiasis, and treat accordingly (do not use barrier films as this will reduce effectiveness of treatment)

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Updated May 2014 Review date: May 2016

mi - 268608

Appendix IX: Common Wound Care Product Allergens

1. Contact Dermatitis to Wound Products and Relevant Products

(Adapted from Alavi et al., 2016)

	Evidence/Comment	Products Containing Allergen
Topical Antibiotics		
Bacitracin	1.5%-9.1% patients >20 years old are allergic	Polysporin ointment preparations but the cream formulations have gramicidin with both products having polymyxin.
Neomycin	7.2% -13.1% patients >20 years old are allergic Neomycin was associated with greater local wound irritation compared with products in combination with polymyxin	Neomycin products or products with the triple antibiotic formulations often have neomycin. Neomycin cross-reacts with framycetin and may cross react with other aminoglycoside antibiotics- gentamycin, amikacin, tobramycin
Preservatives		
Propylene glycol (PG)	Parabens are ubiquitous in topical formulations and seldom cause irritation or very rarely a specific allergen	Hydrogels may contain PG, as well as benzoyl peroxide, or sodium alginate
Formaldehyde –releasing preservatives including quaternium 15		
Fragrances		
balsam of Peru: can cross-react with fragrances	Stage I-II pressure ulcers treated with trypsin/balsam of Peru/castor oil combination product	Some combination ointments have balsam of Peru Fragrance is present in most topical skin care products Unscented products may have a masking fragrance
Hydrocolloids		
Colophony	Sensitisation with certain hydrocolloids and positive patch test to colophony in 4%.	Some hydrocolloids contain a derivative of colophony that is the most common allergen in hydrocolloids, but patch test to colophony may negative (test to the hydrocolloid product)
Carboxymethylcellulose		

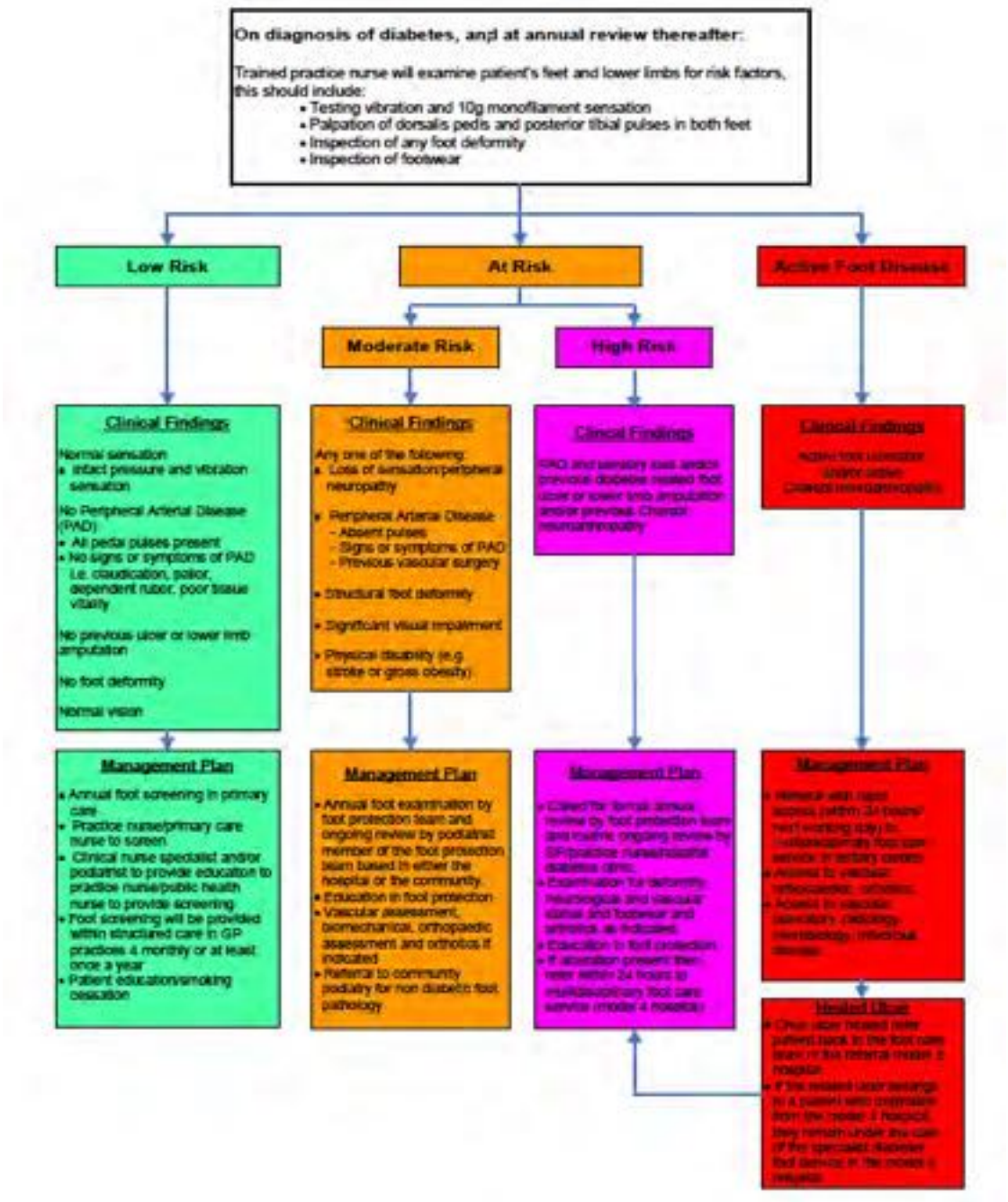
2 **Comparisons of 10 Top Allergens in Leg Ulcers (Adapted from Alavi et al., 2016)**

	Reich-Schupke et al (2010), Germany (n=95)	Beliauskiene et al. (2011), Lithuania (n=94)	Valois et al. (2015), France (n=354)	Renner et al (2013), Germany (n=70)	Barbaud et al (2009), France (n=423)
Myroxylon *Pereirae resin* (balsam of Peru)	8	8	10	10	10
Lanolin alcohol		6	1	8	7
Amerchol L101	6		5		8
Fragrance mix I			9		9
Benzocaine		10		5	
Colophonium		9			5
Fragrance Mix I and II	7			6	
Fragrance Mix II		3		9	
Benzalkonium Chloride			6		6
Thiuram Mix				7	3

*Top 10 allergens in each study, given a score of 10 (most common allergen) to 1(least common allergen)

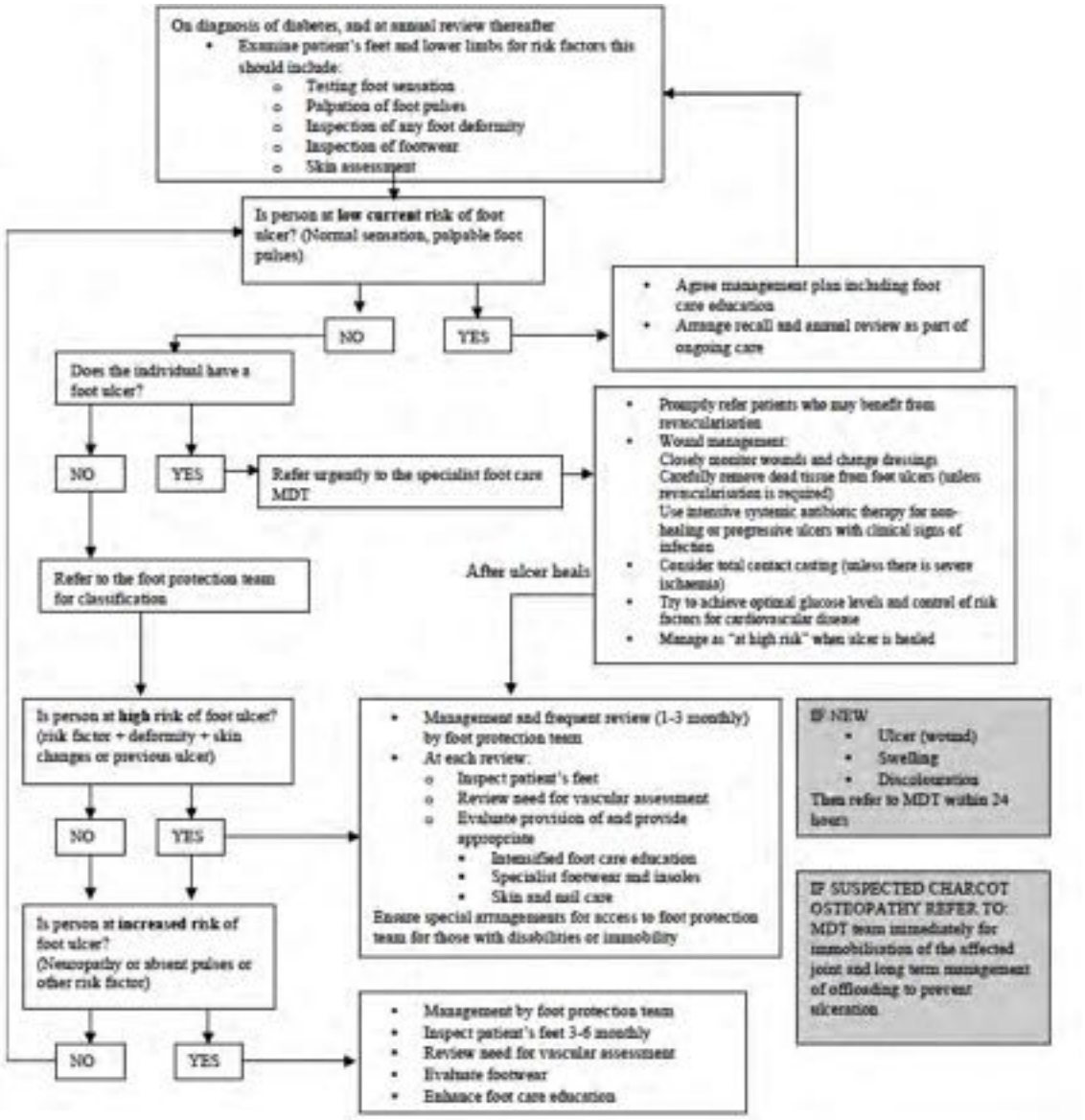
Appendix X: Diabetic Foot Resources

1. Integrated Model of Management/Care Pathway for People with Diabetic Foot Problems (HSE 2011)



2. Management /Care Pathway for people with Diabetic Foot Problems

Adapted from NICE Guidelines for Diabetic Foot Care (2004, 2016)



3. Diabetic Foot Infection Classification

Infectious Diseases Society of America and International Working Group on the Diabetic Foot Infection Classifications of Diabetic Foot Infection (IWGDF, 2015)

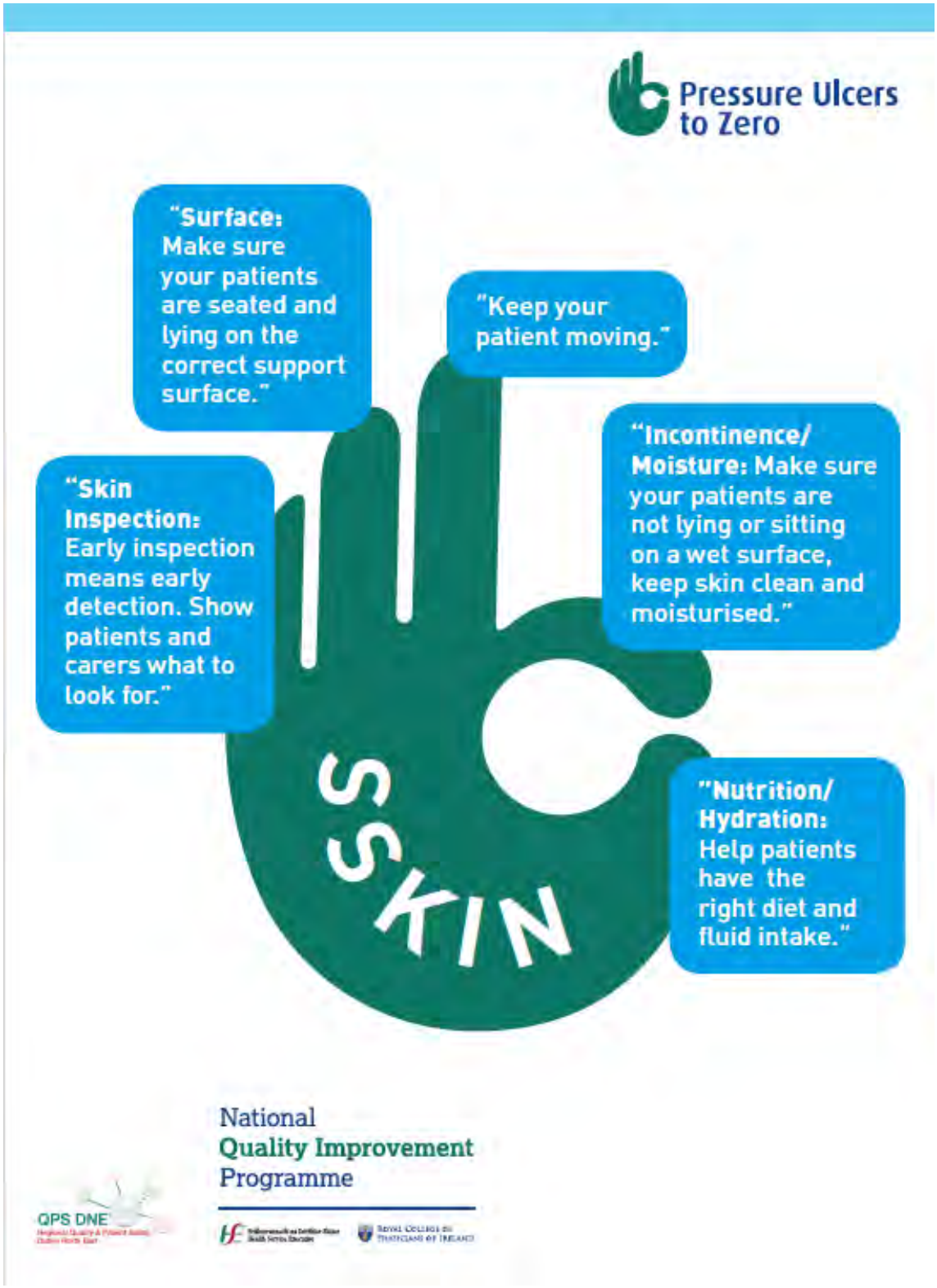
Clinical Manifestation of Infection	PEDIS Grade	IDSA Infection Severity
No symptoms or signs of infection	1	Uninfected
Infection present, as defined by the presence of at least 2 of the following items: • Local swelling or induration • Erythema • Local tenderness or pain • Local warmth • Purulent discharge (thick, opaque to white or sanguineous secretion)		
Local infection involving only the skin and the subcutaneous tissue (without involvement of deeper tissues and without systemic signs as described below). If erythema, must be >0.5 cm to ≤2 cm around the ulcer. Exclude other causes of an inflammatory response of the skin (eg, trauma, gout, acute Charcot neuro-osteoarthropathy, fracture, thrombosis, venous stasis).	2	Mild
Local infection (as described above) with erythema > 2 cm, or involving structures deeper than skin and subcutaneous tissues (eg, abscess, osteomyelitis, septic arthritis, fasciitis), **and** No systemic inflammatory response signs (as described below)	3	Moderate
Local infection (as described above) with the signs of SIRS, as manifested by ≥2 of the following: • Temperature >38°C or <36°C • Heart rate >90 beats/min • Respiratory rate >20 breaths/min or $PaCO_2$ <32 mm Hg • White blood cell count >12 000 or <4000 cells/μL or ≥10% immature (band) forms	4	Severe[a]

Abbreviations: IDSA, Infectious Diseases Society of America; $PaCO_2$, partial pressure of arterial carbon dioxide; PEDIS, perfusion, extent/size, depth/tissue loss, infection, and sensation; SIRS, systemic inflammatory response syndrome.

[a] Ischemia may increase the severity of any infection, and the presence of critical ischemia often makes the infection severe. Systemic infection may sometimes manifest with other clinical findings, such as hypotension, confusion, vomiting, or evidence of metabolic disturbances, such as acidosis, severe hyperglycemia, and new-onset azotemia [29, 43, 44].

Appendix XI: Pressure Ulcer Resources

1. The SSKIN Bundle (HSE and RCPI, 2014)



SSKIN BUNDLE

Pressure Ulcers to Zero

Frequency of care delivery (circle as appropriate)	1 hrly	2hrly	3hrly	4hrly								
Date												
Time (24 Hour Clock)												
SURFACE	Indicate each day if Foam Mattress or Pressure Relieving Mattress											
Mattress appropriate & functioning correctly												
Appropriate seating												
Heel protectors												
SKIN INSPECTION	Inspect skin at boney prominence every 2-4 hours. Existing Pressure Ulceration **Y/N CIRCLE** Stage* & site of existing ulceration recorded in wound assesment chart **Y/N CIRCLE**											
Pressure areas checked												
New Redness State Site:												
KEEP MOVING	Frequency of repositioning is determined by skin inspection if red at least 2 hourly											
BED – R side												
BED – L side												
BED – Back												
CHAIR												
Standing/Mobilising												
INCONTINENCE	Incontinence Related Skin Care regime Implemented Y/N											
Dry and Clean												
Peri-anal skin healthy												
NUTRITION	Fluid Balance Chart/Food Chart in progress Y/N (Circle and continue) Otherwise record below.											
Meal/Snack taken												
Drink taken												
Supplements taken												
Signature												
Grade: SN = Staff Nurse												
HCA= Health care Attendant												
OT= Occupational Therapist												
D= Dietician												
P= Physiotherapist												
S= Student												
SALT												
KEY: Care Delivered: √ = YES X = NO (if NO Document & Explain in Nursing notes)												

RED SKIN - RELIEVE PRESSURE - REVERSE DAMAGE

Patient Pressure Ulcer Prevention Information booklet given ☐

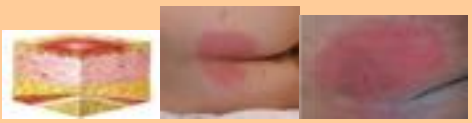
Category/Stage: Please refer to the HSE National Wound Management Guidelines 2017 for the Pressure Ulcer Classification System

2. Pressure Ulcer Staging Chart

HSE 2018 PRESSURE ULCER CATEGORY / STAGING SYSTEM RECOMMENDATION

Definition: ***"A pressure ulcer is a localised 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 has yet to be elucidated"***

Category / Stage I



Category/ Stage I: Intact skin with non – blanchable redness of a localised area usually over a bony prominence. Discolouration of the skin, warmth, odema, hardness or pain may also be present. Darkly pigmented skin may not have visible blanching. The area may be painful, firm, soft, warmer or cooler as compared to adjacent skin. (EPUAP 2009).

Category/Stage II

Category / Stage II: Partial thickness skin loss of dermis presenting as a shallow ulcer with a red pink wound bed, without slough. May present as an intact or open/ ruptured serum filled blister filled with serous or sero- sanginous fluid. Presents as a shiny or dry shallow ulcer without slough or bruising. (EPUAP 2009).

Category/Stage III

Category / Stage III: Full thickness skin loss. Subcutaneous fat may be visible but bone, tendon or muscles are not exposed. Slough may be present but does not obscure the depth of tissue loss. The stage may include undermining or tunnelling (EPUAP 2009).

Category/Stage IV

Category / Stage IV: Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present. This stage often includes undermining and tunnelling. Exposed bone / muscle

Suspected deep pressure and shear induced tissue damage, depth unknown

In individuals with non-blanchable redness and purple/maroon discoloration of intact skin combined with a history of prolonged, unrelieved pressure/shear, this skin change may be an indication of emerging, more severe pressure ulceration i.e. an emerging **Category/Stage III or IV Pressure Ulcer**. Clear recording of the exact nature of the visible skin changes, including recording of the risk that these changes may be an indication of emerging more severe pressure ulceration, should be documented in the patients' health record. These observations should be recorded in tandem with information pertaining to the patient history of prolonged, unrelieved pressure/shear.

It is estimated that it could take **3-10 days** from the initial insult causing the damage, to become a **Category/Stage III or IV Pressure Ulcer** (Black et al, 2015).

Stable eschar (dry adherent, intact without erythema or fluctuance) on the heel serves as the body's biological cover and should not be removed. It should be documented as at least Category / Stage III until proven otherwise.

3. Repositioning: 30° Tilt and 90° Tilt (Moore et al., 2011)

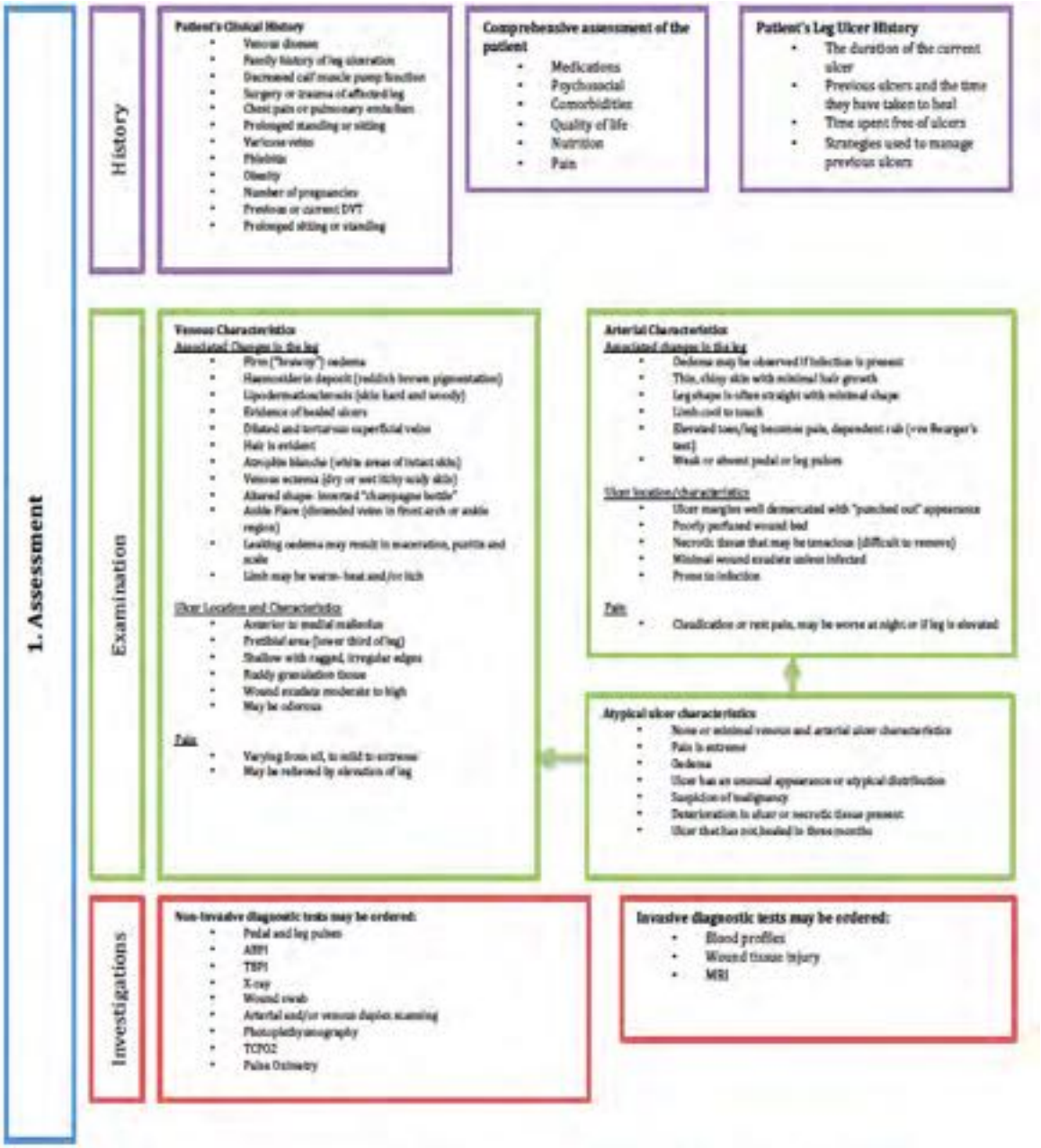
✔ 30° Tilt

✖ 90° Tilt

Appendix XII: Leg Ulcer Resources

1. Flow Chart for the Assessment of Venous Leg Ulcers

(Adapted for the Irish Context from AWMA/ NZWCS, 2011; Andriessen et al., 2017)

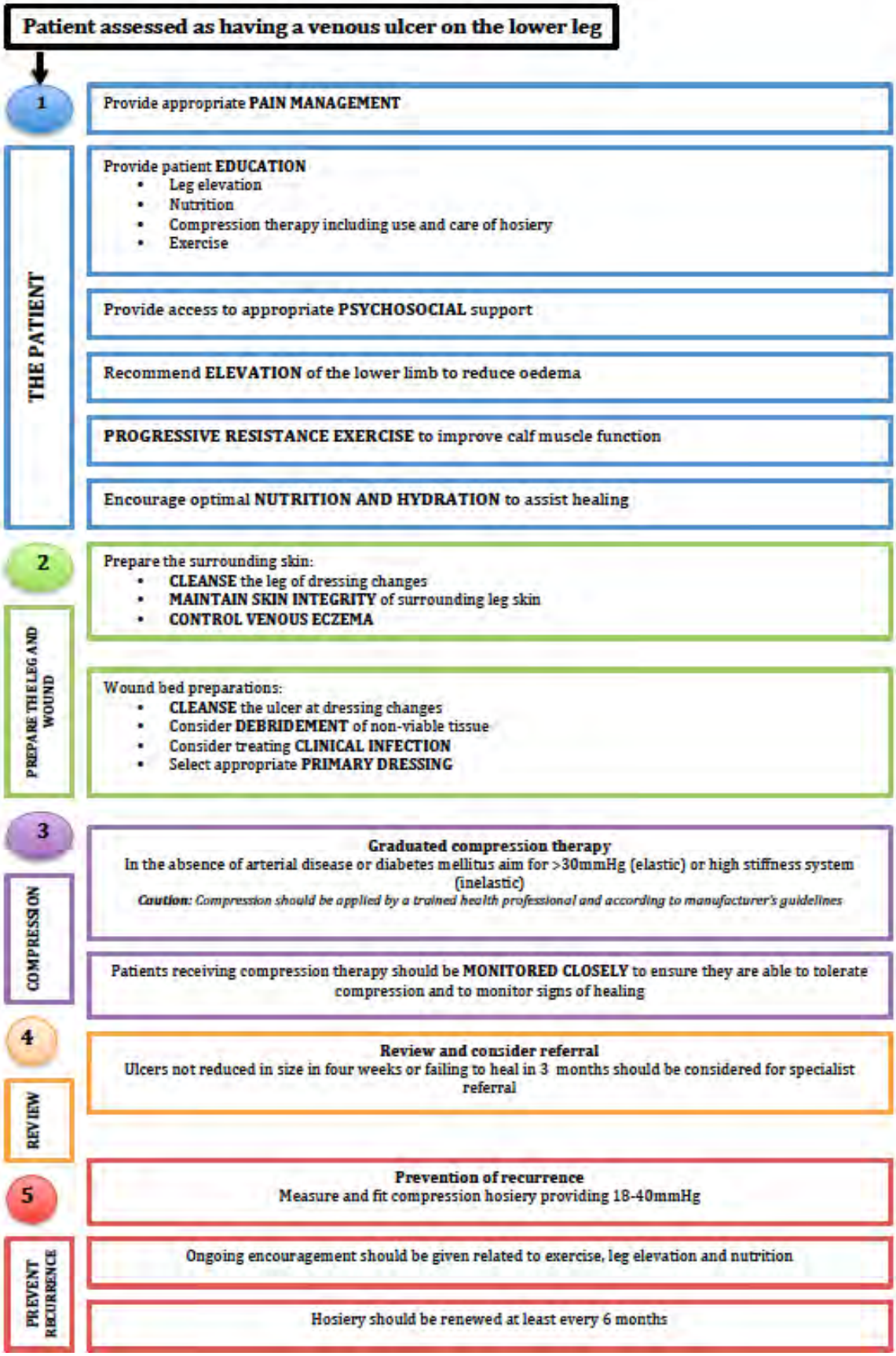


2. Diagnosis

Ankle brachial pressure index	Arterial circulation	Compression treatment
ABPI > 1.00-1.3	Normal	Apply compression
ABPI = 0.8- 1.0	Mild peripheral disease	Apply compression with caution
ABPI ≤ 0.8- 0.6	Significant arterial disease	Use modified compression with caution- refer to specialist
ABPI < 0.5 ABPI >1.3	Critical ischaemia Refer to vascular/diabetic specialist	Do not compress – refer urgently to vascular specialist

2. Flow Chart for the Management of Venous Leg Ulcers

(Adapted for the Irish ContexT from AWMA/ NZWCS, 2011)



3. Lower Leg Changes Associated with Venous Hypertension and CVI

TABLE 3 | Lower leg changes associated with venous hypertension and CVI

Oedema		Swelling of the limb that may indent if finger pressure is applied (pitting oedema); due to increased capillary permeability
Ankle flare		Fan-shaped pattern of dilated veins around the malleoli on the medial or lateral aspects of the ankle and foot; due to dilation of veins in these areas because of venous hypertension
Haemosiderin deposit		Reddish brown discolouration of the skin; due to the deposition of haemosiderin in the skin
Dermatolipos clerosi		Areas of painful, tight skin with hardened subcutaneous tissues just above the ankle; are due to the infiltration of fibrin and inflammation and result in the leg shape resembling an inverted champagne bottle
Atrophie blanche		White areas with decreased capillary density, often associated with lipodermato- sclerosis
Varicose eczema		Itchy, erythematous, weeping and scaled areas of skin that may be painful; due to inflammation triggered by oedema resulting from venous hypertension

N.B: Skin changes associated with CVI may coexist. Photos courtesy of Giovanni Mosti, Rut Quin, Patricia Senet and Wolfgang Hanschmidt

Appendix XIII: Malignant Fungating Wound Resources

1. Assessment Tools for Malignant Fungating Wounds (EONS, 2015)

Assessment Tool	Items covered	Target User
Wound Symptoms Self-Assessment Chart	**Wound-related symptoms** (pain from the wound, pain during dressing change, leakage of exudate, bleeding from the wound, smell from the wound and itching related to the wound) **Level of interference** (mood, anxiety, alertness, attitudes, functional abilities and severity of clinical symptoms).	Can be completed by the patient or by a caregiver.
TELER System	**All aspects of local wound management and psychosocial impact of wounds are covered:** • Discomfort • Skin condition from erythematous maceration from exudate • Skin stripping from dressings and fixation tapes • Peri-wound irritation, necrotic tissue • Sustained dressing fit in order to contain exudate leakage • Odour • Intrusion of dressings and dressing changes on day to day living	Designed to be completed by patients, carers, clinicians. A licence is required to adopt TELER (http:www/ longhanddata.com)
Hopkins Wound Assessment Tool	**Wound-classifications** (wound, predominant colour, hydration, drainage, pain, odour, tunnelling/undermining).	
The malignant wound assessment tool-clinical (MWAT-C)	**Captures:** • Demographic Information • Symptom Assessment • Objective Wound Assessment **Domains include:** • Clinical wound features • Physical effects: pain, oedema, exudate, odour, • Function • Emotional and social impacts of the wound.	Designed to be completed by clinicians.
Palliative Performance Scale (PPS)	• Describes patient's current functional level. • Provides criteria for workload assessment or other measurements and comparisons • Appears to have prognostic value.	Designed to be completed by clinicians.
Toronto Symptom Assessment System for Wounds (TSAS-W)	**Wound-related symptoms** • Pain with dressings • Pain between dressing changes • Exudate/drainage • Odour	This scale can be completed either by the patient, with assistance from the caregiver or by the caregiver him or herself.

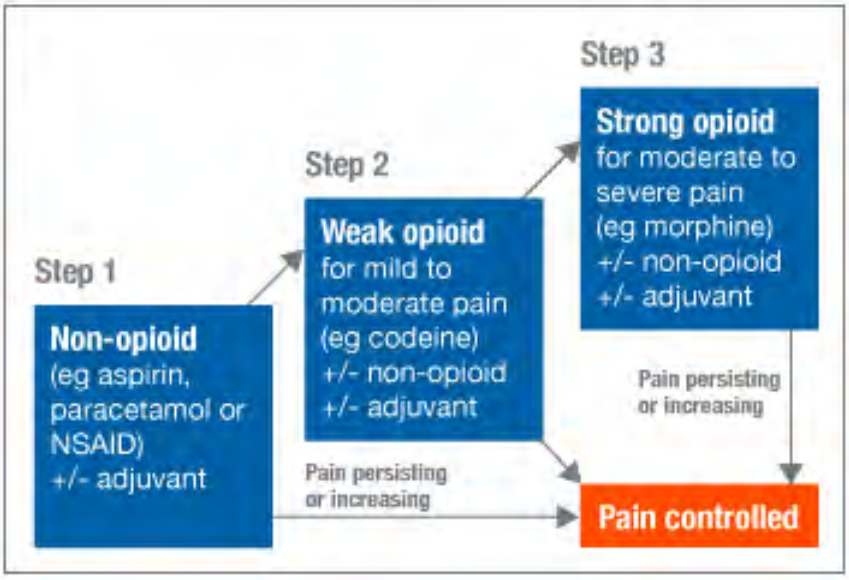
	• Itching • Bleeding **Psychosocial aspects** • Cosmetic or aesthetic concern • Swelling or oedema around the wound, • Bulk or mass effect from the wound, • Bulk or mass effect from the dressing	
Schulz Malignant Fungating Wound Assessment Tool	**General patient information** assessment date, chart number, patient's name, birth date, cancer diagnosis, wound onset date, medical history, medications and allergies; **Items concerning the wound** • Pain with or between dressing changes • Location of pain description of odour and cause amount of exudate, • Bleeding (location and quantity), • Location of oedema, • Tissue type (in per cent), • Wound location, • Wound dimensions • Wound classification (shape of wound) • Appearance of peri-wound skin and wound management	Designed to be completed by clinicians

2. List of Haemostatic Agents (EONS, 2015)

Category	Example	Comments
Natural Haemostats	Calcium alginates Collagen Oxidized Cellulose	• Control minor Bleeding • Available as a dressing • Bioabsorbable
Coagulants	Gelatin sponge Thrombin	• Expensive • Risk of embolisation
Sclerosing agents	Silver nitrate Gelatin sponge	• Can cause stinging and burning when applied • Leaves a coagulum that can act as a pro-inflammatory stimulus
Oral Fibrinolytic antagonists	Tranexamic acid	• Oral agent • Can have gastrointestinal effects (nausea/vomiting)
Astringents	Sucralfate	• Topical • Can leave a residue on wound
Vasoconstriction	Adrenaline	• Gauze soaked in adrenaline 1:1000 applied with pressure for 10 minutes

3. World Health Organisation Analgesic Ladder for Cancer Pain (WHO, 1986)

The WHO pain ladder is a framework for providing symptomatic pain relief. The three-step approach is inexpensive and 70–90% effective[1–4]	
By mouth	The oral route is preferred for all steps of the pain ladder[1,2]
By the clock	Cancer pain is continuous - analgesics should be given at regular intervals (every three to six hours), not on demand[1]
Adjuvants	To help calm fears and anxiety, adjuvant drugs may be added at any step of the ladder



Appendix XIV: Membership of the Guideline Review Group

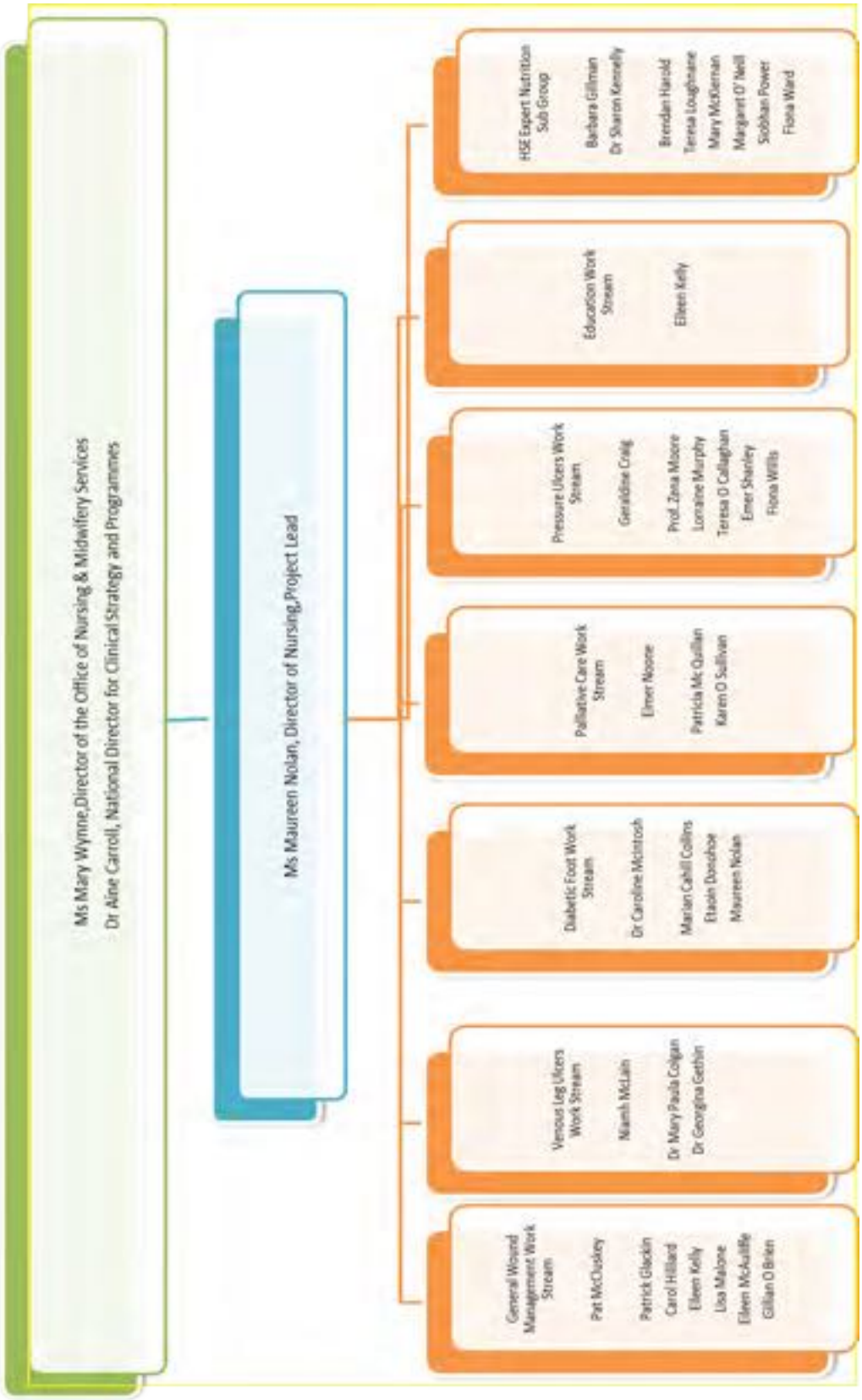
1. Guideline Review Group Members

Ms. Marian Cahill Collins	Advanced Nurse Practitioner: Vascular, University College Hospital Galway, Honorary Clinical Fellow National University of Ireland Galway.
Dr. Mary Paula Colgan	Associate Professor of Vascular Disease, Trinity College and St. James's Hospital.
Ms. Geraldine Craig	Clinical Nurse Specialist: Tissue Viability, Our Lady of Lourdes Hospital and Representative for Tissue Viability Nurses Association of Ireland.
Ms. Etaoin Donohoe	Clinical Nurse Specialist: Tissue Viability, Beaumont Hospital and Representing the Hospital Groups Directors of Nursing.
Dr Georgina Gethin	Head of School of Nursing and Midwifery, National University of Ireland Galway.
Dr. Patrick Glackin	Area Director of Nursing and Midwifery Planning and Development, HSE West, Office of Nursing and Midwifery Services Director (ONMSD).
Ms. Carol Hilliard	Nurse Practice Development Coordinator, Our Lady's Children's Hospital, Crumlin and Representing Children's Nursing.
Ms. Eileen Kelly	Director, Centre of Nursing and Midwifery Education, Cork University Hospital.
Ms. Lisa Malone/ Ms. Sinéad Morrissey	Practice Development Facilitator, Nursing Homes Ireland
Ms. Eileen McAuliffe	Clinical Nurse Specialist: Infection Prevention and Control, Mater Private Hospital, Cork and Representing Infection Prevention Control, Ireland.
Ms. Pat Mc Cluskey	Advanced Nurse Practitioner: Wound Care and Tissue Viability, Cork University Hospital Group.
Professor Caroline McIntosh	Established Professor and Head of Podiatric Medicine, School of Health Sciences, National University of Ireland Galway.
Ms. Niamh Mc Lain	Clinical Nurse Specialist: Tissue Viability Dunlaoghaire Dublin South, Community Health Office, Area 6 and Representing Wound Management Association of Ireland.

Ms. Patricia Mc Quillan	Professional Development Co-ordinator for Practice Nurses, Primary Care Unit (South East), HSE South and Representative for Practice Nursing.
Professor Zena Moore	Professor of Nursing, Head of the School of Nursing and Midwifery, Royal College of Surgeons Ireland.
Ms. Maureen Nolan	Project Lead, Director of Nursing, Office of Nursing and Midwifery Services Director (ONMSD).
Ms. Eimer Noone	Clinical Nurse Specialist: Tissue Viability, Our Lady's Hospice and Care Services, Representing Palliative Care.
Ms. Gillian O Brien	Advanced Nurse Practitioner: Tissue Viability, Naas General Hospital.
Ms. Teresa O Callaghan/ Ms. Lorraine Murphy	National Quality Improvement Advisor, National Quality Improvement Division HSE and Representing the Quality Improvement Division Directorate.
Ms. Jean O Keeffe	Director of Public Health Nursing, Waterford Community Services and Representing Director of Public Health Nurse Group.
Ms. Karen O Sullivan	Continuing Education Officer, Regional Centre of Nurse and Midwifery Education, Waterford, Wexford, Carlow/Kilkenny and South Tipperary and Representing Care of Older Persons.
Ms. Emer Shanley	Clinical Nurse Specialist:Tissue Viability, West Cork Community Care, Community Services and Representing the Institute of Community Health Nursing (Vice President).
Ms. Fiona Willis	Nursing and Midwifery Planning and Development Officer Cork/Kerry, HSE South and Representing the Irish Nursing and Midwifery Practice Development Association.
HSE Expert Nutrition Sub-Group	
Ms Barbara Gillman	Clinical Specialist Dietitian, Acute Hospitals Division
Mr Brendan Harold	Dietitian Manager (Older Persons Residential Care)
Dr Sharon Kennelly	Clinical Specialist Dietitian, Primary Care Primary Care Division
Ms Teresa Loughnane	Clinical Specialist Dietitian (Acute Hospitals)
Ms Margaret O' Neill	National Dietetic Advisor

Ms Siobhan Power	Senior Dietitian (Acute Hospitals)
Ms Fiona Ward	Dietitian Manager (Acute Paediatrics)
Royal College of Surgeons Ireland	
Ms. Jane Burns	Research Officer, Royal College of Surgeons in Ireland.
Dr. Declan Patton	Senior Lecturer, Director of Nursing and Midwifery Research, Royal College of Surgeons in Ireland.
Ms. Aoife Reilly	Research Assistant, Royal College of Surgeons in Ireland.

2. Project Organogram



3. Work Stream Groups

General Wound Management
Pat McCluskey: Lead
Dr. Patrick Glackin
Carol Hilliard
Eileen Kelly
Lisa Malone
Eileen McAuliffe
Gillian O Brien

Pressure Ulcers
Geraldine Craig: Lead
Prof. Zena Moore
Lorraine Murphy
Teresa O Callaghan
Emer Shanley
Fiona Willis

Leg Ulcers
Niamh McLain: Lead
Dr Mary Paula Colgan
Dr Georgina Gethin

Diabetic Foot
Prof. Caroline McIntosh: Lead
Marian Cahill Collins
Etaoin Donohoe
Maureen Nolan

Palliative Wound Care
Eimer Noone: Lead
Patricia Mc Quillan
Karen O Sullivan

Education
Eileen Kelly: Lead

Nutrition
Ms Barbara Gillman: Lead
Mr Brendan Harold
Dr Sharon Kennelly
Ms Teresa Loughnane
Ms Mary McKiernan
Ms Margaret O' Neill
Ms Siobhan Power
Ms Fiona Ward

Appendix XV: Conflict of Interest Form

Ethics in Public Office Acts 1995 and 2001

- Designated Positions of Employment -

Statement of Interests for the purposes of Section 18 of the Ethics in Public Office Act 1995

Please complete in **BLOCK CAPITALS**

Name:	
Designated Position of Employment Held:	
Public Body:	
Date of Appointment:	
Period comprehended by this Statement (i.e. 1 January to 31 December or part thereof):	
Address for Correspondence:	

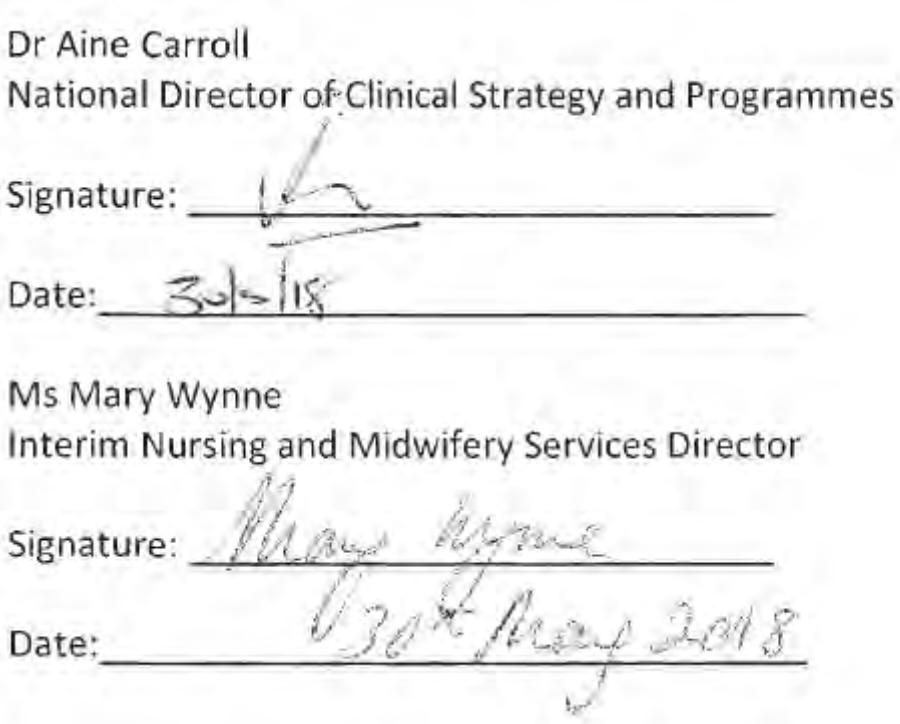
In relation to each of the following disclosable interests, you should state any interest held by you and any interests held, to your actual knowledge, by your spouse[1] or civil partner[2], a child of yours, or a child of your spouse, which could materially influence[3] you in or in relation to the performance of your official functions. **The amount or monetary value of the interests need not be specified.** Explanatory notes on certain of the required statements are attached.

Appendix XVI: Membership of the Approval Governance Group

List of all Members of the Approval Governance Group who have Final Approval of the Guideline.

Dr Aine Carroll
National Director of Clinical Strategy and Programmes

Ms Mary Wynne
Interim Nursing and Midwifery Services Director



Appendix XVII: Glossary

Abrasion	Produced by a rough surface striking the body tangentially removing part of the outer layer of skin.
Abscess	A collection of purulent material.
Active support	Active Support is a person-centered approach to providing direct support. The goal of Active Support is to ensure that people with even the most significant disabilities have ongoing, daily support to be engaged in a variety of life activities and opportunities of their choice.
Adiposity	Severe or morbidly overweight.
Aetiology	The cause, set of causes, or manner of causation of a disease or condition
Altered shape of lower leg	Inverted champagne bottle
Amputation	Resection of a terminal part of a limb
Anaerobic	Organisms that do not require oxygen for survival
Angiography	Method to visualise blood vessels
Ankle Brachial Pressure Index (ABPI)	The ratio of ankle to brachial systolic blood pressure and assesses lower extremity arterial perfusion. Measurement can be performed with a hand-held Doppler ultrasound
Ankle flare/corona phlebectatica	Venous congestion – tiny capillaries become swollen and are visible through the skin
Antibiotic	A chemical substance produced by a micro-organism which has the capacity to dilute solutions, to inhibit selectively the growth (static) of micro-organisms or to kill (cidal) them
Arteriolosclerosis	A form of cardiovascular disease affecting the small arteries and arterioles
Asepsis	Without pathogens, infections, or toxins
Aseptic Technique	Absence of micro-organisms in the surgical environment to reduce the risk of infection
Atraumatic	A medical or surgical procedure) causing minimal tissue injury
Atrophie blanche	Avascular or white skin scarring as a result of thrombosis and obliteration of capillaries in the deeper dermis – can be very painful and often appears in areas where there is hyper-pigmentation or lipodermatosclerosis
Autolysis	Natural, spontaneous process of devitalised tissue being separated from viable tissue. Together with proteolytic enzymes, macrophage activity is thought to be responsible for autolysis.
Bacteraemia	The quantity of microorganisms present (e.g., palktonic bacteria or biofilm)
Barrier product	Substance used as a protective layer (barrier) to prevent or correct skin irritation.

Blanchable Erythema	Reddened areas on the skin that temporarily turn white or pale when pressure is applied with a fingertip. It is usually due to a normal reactive hyperaemia
'Bottoms out'	Expression used to describe inadequate support from a mattress or seat cushion as determined by a hand check. If, when a fist is pressed into the surface of a mattress or seat cushion the supporting base can be felt the item is said to have 'bottomed out' and is no longer able to provide pressure relief
Bridging	Epithelial tissue forms a bridge from one side of wound to the other with a cavity underneath. Usually seen in an infected cavity wound
Calcaneus	The heel bone
Callus	A build-up of keratinised skin. This is a reaction to persistent pressure
Catabolism	Catobolism can be defined as the energy burning aspect of metabolism. The degree of metabolic response induced by disease in the body determines the catabolic rate and at what point during a disease when demand for energy exceeds supply resulting in malnutrition.
Cellulitis	A spreading non-suppurative infection of the soft tissue. Inflammation and infection of the skin and subcutaneous tissue most commonly due to streptococci or staphylococci
Charcot-Neuroarthropathy	Non-infectious destruction of bone and joint associated with neuropathy
Chronic Venous Disease	(any) morphological and functional abnormalities of the venous system of long duration manifested either by symptoms and/or signs indicating the need for investigation and/or care
Chronic Venous Disorder	This term includes the full spectrum of morphological and functional abnormalities of the venous system.
Chronic Venous Insufficiency (CVI)	a term reserved for advanced CVD, which is applied to functional abnormalities of the venous system producing oedema, skin changes or venous ulcers.
Chronic Wound	A wound that has failed to proceed through an orderly and timely reparative process to produce anatomic and functional integrity or that has proceeded through the repair process without establishing a sustained anatomic and functional result.
Claudication	Claudication is pain and/or cramping of the lower leg muscles due to inadequate circulation.
Clean technique	Modified aseptic technique performed by one person where sterile gloves are not required and potable tap water or shower can be used for cleansing
Clinician	A health professional whose practice is based on direct observation and treatment of a patient.
Collagen	The most abundant protein of the dermis, accounting for 70 to 80% of its dry weight; the main supportive protein of the skin and protective tissue

Colonisation	Micro-organisms present in or on a host, without host interference or interaction and without eliciting symptoms in the host.
Co-morbidity	The presence of co-existing or additional disease with reference to either an initial diagnosis or to the index condition that is the subject of study. Co-morbidity may affect the ability of affected individuals to function and their survival. It may be used as a prognostic indicator for length of hospital stay, cost factors and outcome or survival
Contact Dermatitis	Is an exogenous eczema caused by external factors that have either irritated the skin or caused an allergic reaction. The eczema normally occurs in areas of direct contact but if sufficiently severe the eczema may become generalised. Researchers have observed that patients with eczema around their leg ulcers have more allergies than those without
Contamination	Presence of micro-organisms but without multiplication
Contraction	A function of the healing process in granulating wounds whereby the edges of the wound are drawn towards each other in wounds healing by secondary intention
Crepitus	A cracking, crunchy, or popping sensation upon palpation of soft tissue related to underlying gas in the tissue released by anaerobes; indicative of the presence of air bubbles in the tissues
Critical Ischaemia:	There is no globally accepted definition of critical ischaemia. Recent guidelines and consensus documents have used a combination of both clinical parameters of, persistent recurring rest pain despite regular analgesia for >2 weeks or ulceration or gangrene of the foot or toes and haemodynamic parameters of absolute ankle pressure or toe systolic pressures (50mmHg or 30mmHg respectively).
Cytokine	A chemical messenger. See also growth factors
Cytotoxic	Chemical that is directly toxic to cells preventing their reproduction or growth
Debridement	The removal of devitalised or contaminated tissue
Dehiscence	The breaking down of surgically closed wound.
Dermatitis	Inflammation of the skin, either due to direct contact with an irritating substance, or to an allergic reaction
Dermatoliposclerosis	Lipodermatosclerosis refers to a skin change of the lower legs that often occurs with venous insufficiency. It is a form of subcutaneous fat inflammation (panniculitis).
Devitalised	Tissue that is no longer viable
Diabetic foot	Infection, ulceration and/or destruction of deep tissue associated with neurological abnormalities and various degrees of peripheral vascular disease in the lower limb in a person with diabetes
Dietitian	A Dietitian is a health professional who has a Bachelor's degree specialising in foods and nutrition, as well as a period of

	practical training in a hospital and a community setting. Dietitians apply the science of nutrition to promote health, treat and prevent malnutrition and provide therapeutic dietary guidelines for patients, clients and the public in health and illness.
Dilated and torturous veins	As venous hypertension increases over time the larger veins become affected and visible through the skin
Doppler	A machine that can detect the movement of blood cells within the blood vessel and measure blood flow. Used to measure the ABPI
Duplex Scan	Identifies blood vessels and blood flow and can diagnose the presence and severity of arterial disease as well as the presence of venous obstruction or incompetence,
Eczema	An inflammatory condition of the skin characterized by redness, itching, and oozing vesicular lesions which become scaly, crusted, or hardened
Elastin	A highly elastic protein in connective tissue and allows many tissues in the body to resume their shape after stretching or contracting. Elastin helps skin to return to its original position when it is poked or pinched
Enteral	Nutritional support or drug administration given via a nasogastric, nasoenteral, or percutaneous tube. Enteral nutrition and drug administration is used when the gastrointestinal tract is functioning
Envelopment	Envelopment is the ability of the support surface to conform around the body
Epithelium or Epithelial tissue	The tissue that migrates across the wound in the final stage of wound healing. These epidermal cells are pink/white in colour at the wound edges or in islands over granulation tissue
EPUAP	European Pressure Ulcer Advisory Panel
Erythema	A redness of the skin caused by congestion of capillaries due to injury, infection, inflammation or hyperaemia
Eschar	Hard necrotic tissue. It often appears black and leathery
Evidence of healed ulcers	Scar tissue present
Excoriation	Stripping of the skin
Exudate	Serous fluid which has passed through the walls of a damaged or overextended vein. Contains growth factors in the acute wound and may contain bacteria, dead white cells, and chronic inflammatory cytokines if the wound is chronic
Fistula	An abnormal passage that has formed between two organs e.g. bowel and skin. Fistulas may be congenital or caused by injury, infection or the spread of malignant disease
Float the heels	A method used to relieve the heel of pressure
Foot deformity	Structural deformities in the foot such as presence of hammertoes, claw- toes, hallux valgus, prominent metatarsal

	heads, status after neuro-osteoarthropathy, amputation or other foot surgery
Foot Protection Service	The foot protection service is usually based outside the hospital, for example, in a health centre or GP clinic. The foot protection service specialises in providing foot care for people with diabetes, preventing diabetic foot problems and dealing with foot problems that don't need to be treated in hospital.
Formulary	A wound dressing formulary consists of an agreed, regularly revised, limited list of dressings by a group of practitioners
Friable	Easily damaged- wound bleeds easily when touched
Friction	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 linen
Gangrene	Death of tissue generally associated with loss of vascular supply and followed by bacterial invasion and putrefaction
Granulation	During the proliferative phase of healing, this is the bright red tissue formed from new capillary loops which are red/deep pink and moist. They have a granular appearance
Growth Factors	Peptides, which are a sub-set of cytokines vital for, cell proliferation
Haematoma	A localised mass of extravasated blood that is relatively or completely confined within an organ or tissue, a space or a potential space. The blood is usually clotted and depending how long it has been there, may manifest various degrees of organisation.
Haemosiderin deposit	Red cells leak out in the tissue causing reddish brown staining of the skin
Haemostasis	The arrest of bleeding either by the physiological properties of vasoconstriction, coagulation or by surgical means
Hallux Valgus	Deformity of the big toe
Heat dissipation	A process in which heat is used or lost without accomplishing useful work
High Specification Reactive Foam Mattress	NICE define High Specification Foam mattresses as 'mattresses made of high density foam or visco-elastic foam which conforms to the body contours resulting in superior pressure reduction to the standard hospital foam mattress.'
HSE	Health Service Executive
Hyperaemia	The presence of excess blood in the vessels supplying part of the body
Hyperglycaemia	Elevated serum glucose levels
Hypergranulation	Over-granulation; excessive laying down of new blood vessels creating a bulge of highly vascular tissue which bleeds easily. The tissue forms beyond the level of the surface level of the wound and prevents epithelialisation from occurring
Hyperkeratosis	A build-up of dry skin.
Hypermetabolic	The physiological state of increased rate of metabolic activity

	and is characterized by an abnormal increase in the body's basal metabolic rate.
Hypersensitivity	The skin can become very sensitive and many substances can cause irritation and allergic responses
Hypertension	High blood pressure
Hypoalbuminemia	An abnormally low blood level of a protein, albumin.
Immersion	The action of immersing someone or something in a liquid.
Incontinence-Associated Dermatitis (IAD)	Incontinence-Associated Dermatitis (IAD) is a moisture associated skin disorder which can occur on any area of skin that is exposed to contact from urine or stool. Duration of exposure, constituents of the moisture source (e.g. pH of urine, particularly alkalinity, digestive enzymes in stool and micro-organism content) and friction between skin, absorptive incontinence devices and bedclothes and contribute to the development of IAD.
Induration	Hard (indurated) pigmented skin (lipodermatosclerosis) may be suggestive of venous disease
Infection	Condition in which the host interacts physiologically and immunologically with a micro-organism. Clinical evidence of redness, heat and pain are prominent. See also surgical site infection
Inflammation	Defensive reaction to tissue injury; involves increased blood flow and capillary permeability and facilitates physiologic cleanup of the wound; accompanied by increased heat, redness, swelling and pain in the affected area.
Intermittent Claudication	Pain experienced in the calf, thigh, or buttock muscles after walking for a distance and which disappears following a few minutes' rest. By implication arterial disease should be suspected and investigated.
Intertriginous Dermatitis	An area where apposing skin surfaces are in prolonged contact such as in the groin or axilla and under the breasts; friction and moisture entrapment are common complications
Ischaemia	Deficiency of blood caused by functional constriction or obstruction of a blood vessel.
Laceration	Produced when a blunt object strikes the skin with sufficient force to stretch and tear it. A crushing injury ensues and the margins of the wound may be ragged, abraded and bruised
Lesion	A broad term referring to abnormalities in tissues, may be visible as tissue injury, sores or ulcers
Lipodermatosclerosis	The limb becomes hard and woody to touch as a result of malnourished tissue and fibrosis
Lymphangitis	Inflammation of the walls of the lymphatic vessels
Maceration	A softening or sogginess of the tissue owing to retention of excessive moisture. Usually presents as moist red/white and wrinkled
Macrophage	Blood cells which destroy bacteria and devitalised tissue and

	produce a variety of growth factors
Malnutrition	Malnutrition can be defined as “a state resulting from lack of intake or uptake of nutrition that leads to altered body composition (decreased fat mass) and body cell mass leading to diminished physical and mental function and impaired clinical outcome from disease.
Microclimate	The climate of a very small or restricted area, especially when this differs from the climate of the surrounding area
Necrosis	The local death of tissue. This tissue is often black/brown in colour and leathery in texture
Neuropathy	Nerve damage leading to numb or sometimes painful feet
Non-Blanchable erythema	Grade I Pressure Ulcer. The ulcer appears as a defined area of persistent redness in lightly pigmented skin, whereas in darker skin tones, the ulcer may appear with persistent red, blue, or purple hues
Non-powered pressure redistribution support surface	Any support surface not requiring or using external sources of energy for operation
The Norton scale	A scale used to predict the likelihood a patient will develop pres sure ulcers
NPUAP	National Pressure Ulcer Advisory Panel
Odds ratio (OR)	An odds ratio (OR) is a measure of association between an exposure and an outcome
Oedema	Capillaries swell and fluid leaks into the tissues
Oral Nutritional Supplements (ONS)	ONS are nutrition products provided orally and are defined in EU legalisation as “foods for a specific medical purpose” (FSMPs). FSMPs are defined as “specially processed or formulated and intended for the dietary management of patients including infants, to be used under medical supervision”.
Orthosis	An appliance which controls, corrects or accommodates a structural or functional abnormality
Osteitis	Inflammation of the substance of a bone
Osteomyelitis	Inflammation of bone and marrow usually caused by pathogens that enter the bone during an injury or surgery
Overgranulation	See hypergranulation
Parenteral	Administered or occurring elsewhere in the body than the mouth and alimentary canal
Pathogen	Any disease- producing agent or micro-organism
Patient	A person who is a recipient of healthcare
Percutaneous Endoscopic Gastrostomy (PEG)	An endoscopic medical procedure in which a tube (PEG tube) is passed into a patient's stomach through the abdominal wall, most commonly to provide a means of feeding when oral intake is not adequate, e.g., because of dysphagia or sedation
Perfusion	Blood flow to the skin

Perioperative	Literally, around (the time of) surgery. More specifically, the period of time extending from when the patient goes into the hospital, clinic, or doctor's office for surgery until the time the patient is discharged home
Peripheral arterial disease (PAD):	Disease of mostly small blood vessels in the extremities (hands and feet), as narrowing of arteries
Periwound	The area immediately around the wound
PH balanced skin cleanser	A skin cleanser with a pH level slightly lower than 9. This aids in keeping the skin moist and intact
Photoplethysmography (PPG)	Used to measure venous refill time and investigate deficiency of the calf muscle pump function. Venous refill time < 20 seconds is indicative of venous insufficiency and potential delay in ulcer healing.
Potable	Water of sufficient quality to be served as drinking water
Pressure Ulcer	Area of localised tissue damage caused by ischaemia due to pressure, friction, or shear
Pressure-reducing/-relieving	Any measure that reduces or relieves the normal force per unit of skin surface areas
Probability	The measure of the chance that the event will occur as a result of an experiment
Proliferative phase	The proliferative phase of healing occurs when the wound is rebuilt with new tissue, made up of collagen and extracellular matrix. During this phase, the wound contracts as new tissues are formed.
Prophylactic dressing	A dressing that is placed onto the skin before any skin damage is evident with a goal of preventing skin breakdown due to pressure, shear, and alternations in the skin's microclimate. Features such as elastic adhesive type (e.g., silicon), the number of dressing layers and their construction, and the size of the selected dressing all contribute to its ability to protect the skin
Purpura	Bleeding beneath the skin or mucous membranes; it causes black and blue spots (ecchymosis) or pinpoint bleeding
Pus	Thick fluid indicative of infection containing leukocytes, bacteria and cellular debris
Pyoderma gangrenous (gangenosum)	A condition that causes tissue to become necrotic, causing deep ulcers that usually occur on the legs. When they occur, they can lead to chronic wounds
Pyogenic	Producing pus
Reactive hyperaemia	Extra blood in vessels occurring in response to a period of blocked blood flow
Redistribute	To alter something's distribution
Registered Dietitian	The title "Registered Dietitian" and "Dietitian" is protected by law so that only qualified practitioners who have met the required education qualifications and continue to maintain their knowledge and skills through continuing professional development, can use that title. CORU is responsible for

	regulation of health and social care professions under the Health and Social Care Professional's Act, 2005, in Ireland.
Reposition	To place something in a different position or to adjust or alter something's position
Revascularisation	Improving blood supply through vascular surgery. A bypass graft will be inserted into the blocked or narrowed blood vessel.
Septicaemia	Septicaemia, also known as sepsis, is a potentially life-threatening infection in which large amounts of bacteria are present in the blood. It is commonly referred to as blood poisoning
Sero-sanguinous	Containing or relating to both blood and the liquid part of blood (serum). Usually refers to fluids collected from or leaving the body, e.g., fluid leaving a wound that is sero-sanguineous is yellowish with small amounts of blood
Serum	An amber-coloured, protein-rich liquid which separates out when blood coagulates
Serum osmolality	A test measures the amount of chemicals dissolved in the liquid part (serum) of the blood
Shear	Trauma caused by tissue layers sliding against each other; results in disruption or angulation of blood vessels
Silicone dressing	A dressing is a dressing coated with silicone as an adhesive or a wound contact layer.
Sinus	Course or pathway that can extend in any direction from the wound surface; results in dead space with potential for abscess formation
Slough	The term used to describe the thick yellow layer which often covers the wound and is strongly adherent to it. Its presence can be related to the end of the inflammatory stage of healing when dead cells have accumulated in the exudate
Standard care	General guidelines that provide a foundation as to how a nurse should act and what he or she should and should not do in his or her professional capacity. Deviating from this standard can result in certain legal implications
Stasis	Stagnation of blood caused by venous congestion
Stratum corneum	The outermost layer of the epidermis, consisting of dead cells (corneocytes). This layer is composed of 15–20 layers of flattened cells with no nuclei and cell organelles
Support surface	A specialised 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 overlays
Surgical Site Infection	Classed according to the Centre for Disease Control (www.cdc.org) classification. That is, only skin and subcutaneous tissue (superficial incisional SSI), and those involving deeper soft tissues of the incision (deep incisional SSI)
Tensile strength	The maximum force or pressure that can be applied to a wound

	without causing it to break apart
The Braden scale(Braden and Bergstrom, 1987)	The Braden Scale for Predicting Pressure Ulcer Risk is a tool that was developed in 1987 by Barbara Braden and Nancy Bergstrom. The purpose of the scale is to help health professionals, especially nurses, assess a patient's risk of developing a pressure ulcer
Thrombosis	Intravascular formation of a blood clot (thrombus)
Tissue tolerance	The dose of radiation an organ can receive before it fails
Toe/brachial Pressure index (TBPI)	Measures arterial perfusion in the toes and is used where tibial vessels cannot be compressed in the presence of calcification, e.g. patients with diabetes and renal disease
Transcutaneous	Through the skin.
Transcutaneous oxygen	Transcutaneous oxygen, tcpO2 or TCOM, is a local non-invasive measurement reflecting the amount of O2 that has diffused from the capillaries, through the epidermis, to a Clark-type electrode at the measuring site. It provides instant continuous information about the body's ability to deliver oxygen to the tissue
Transitional care team	Transitional care refers to the coordination and continuity of health care whilst moving from one healthcare setting to another or to home, between clinicians and settings as patient conditions and care needs change during the course of a chronic or acute illness.
Trophic	Thinning of skin and ridging of nails
Tunnelling	A course or path of tissue destruction, sometimes called a sinus tract, occurring in any direction from the surface or edge of a wound. It results in dead space with a potential for abscess
Ulcer	Open sore
Undermining	An area of tissue destruction extending under intact skin along the periphery of a wound commonly seen in shear injuries. It can be distinguished from a sinus tract / tunnelling in that it involves a significant portion of wound edge
Vasculitis	Inflammation of small arteries or veins with resulting fibrosis and thrombi formation. It is usually associated with rheumatoid disease
Vasoconstriction	Constriction of the blood vessels
Venous Eczema	Venous eczema, also known as gravitational dermatitis, refers to a type of eczema/dermatitis that affects one or both lower limbs in association with venous insufficiency.
Venous Insufficiency	Deep or superficial veins become incompetent permitting reverse flow and resulting in raised pressure in the superficial veins during ambulation
Venous:	Pertaining to veins
Virulence	Degree of pathogenicity of an organism
Viscoelastic	The property of materials that exhibit both viscous and elastic characteristics when undergoing deformation. Viscous

	materials, like honey, resist shear flow and strain linearly with time when a stress is applied
Waterlow risk assessment scale	An estimated risk for the development of a pressure sore in a given patient
Wound	A cut or break in the continuity of the skin caused by injury or operation
Wound Bed Preparation (WBP):	Is the global management of the wound to accelerate endogenous healing or to facilitate the effectiveness of other therapeutic measures
30° Tilt	The 30- degree tilt is a patient repositioning technique, which can be achieved by rolling the patient 30-degrees to a slightly tilted position, with pillow support at the back. Please see appendix XVI for an example.

Appendix XVIII: Search Strategy

1. Scoping Tasks
The scope of this review will incorporate the following tasks, all of which were needed to complete a substantive literature review of the evidence.

2. Methodological approach
The methodological approach was applied across four significant areas of investigation. These were:
1. Search Strategy development
2. Criteria application (Inclusion/Exclusion)
3. Data Extraction Methods
4. Data Analysis

3. Search Strategy Development:
This involved the development of a robust, inclusive and replicable search strategy. This concentrated on developments in Wound Care Management and practice since 2009.

***Criteria Application*:** The development and implementation of extensive inclusion/exclusion criteria was used to facilitate the identification of appropriate and relevant information in each of the areas identified in the Research Call.

***Data Extraction Methods*:** For purposes of this review a detailed coding sheet was developed to capture essential bibliographic data, as well as inclusion/ exclusion criteria, identification of new methods or clinical approaches for wound management and other developments in this area. In instances of disagreement between the reviewers, the final decision rested with the Principal Investigator (PI).

Data analysis
The data analysis followed these steps:
All sourced literature that met the inclusion criteria for the review was evaluated through an online template. Data was extrapolated from the online template to identify consistencies and inconsistencies in reviewer's evaluation of the literature. Any inconsistencies were reviewed by the PI.

The AGREE II (Brouwers et al., 2010) 7 point scale for Clinical Guidelines was applied. The Evidence Based Literature Critical Appraisal tool was used for all other literature. As part of the data analysis function results were organised into themes and classifications.

4. Outcomes of Interest
The outcomes of interest were the most effective methods of: wound assessment, diagnosis, treatment and prevention. Clinical questionsgiven to the research team by each the work stream groups were answered using the PICO model.

The impact of different prevention/management plans on clinical outcomeswere examined in terms of the following broad areas:

- Accuracy of diagnosis

- Patient risk stratification
- Frequency of follow up
- Prevention of wounds: prevalence and incidence
- Prevention of complications associated with wounds: e.g. wound infection, morbidity, mortality, quality of life, length of hospital stay
- Patient satisfaction
- Impact of treatment modalities (cleansing, dressing, offloading, adjunct therapies) on wound healing: absolute resolution of the wound, wound size reduction, rate of wound healing
- Multidisciplinary team involvement
- Patient self-management
- Care provision within primary care
- Integrated health plans for high needs patients
- Staff satisfaction, staff competence

5. Inclusion/Exclusion Criteria

The Wound Management guidelines are intended to support the standardization of care and to encourage best clinical practice. The following criteria were applied:

Inclusion criteria
Original research paper: Quantitative design (randomised controlled clinical trial, controlled clinical trial, pre-post-test design) Qualitative Prospective or retrospective design Existing guidelines Systematic reviews
Adults or children at risk of, or with an existing wound
Must relate to the wound types of interest
English Language
Care delivered in any health care setting
Focuses on either: Assessment Diagnosis Management Prevention

Exclusion criteria
Does not deal with Wounds

6. Methodology for Searching

A detailed and robust search strategy was implemented to identify all research on the topic of Wound Management.The above inclusion and exclusion criteria were applied when searching for literature in the following domains: Bibliographic databases including PubMed, Embase, Cochrane Library, LILACS, IBECS and relevant grey literature.

Types of articles included systematic reviews, original research articles and grey literature.

7. Search Strategy Development

Name	Subject Coverage
Core	
Cochrane Library Cochrane Reviews Other reviews Trials	Intervention and diagnostic reviews Critically appraised and re-structured abstracts Register of clinical trials
Medline	Three different versions: PubMed, OVID Medline and EBSCO Medline
Embase	European studies, and conference abstracts
Web of Knowledge	Conference abstracts, citation searching
SCOPUS	Largest abstract and citation database of peer-reviewed literature: scientific journals, books and conference proceedings. Delivering a comprehensive overview of the world's research output in the fields of science, technology, and Medicine.
Subject / study dependant	
CINAHL	Nursing and allied health
Web of Knowledge	Social Science
ERIC	Education

Grey Literature was also searched in line with the HSE Library's Guide to Grey Literature (http://www.hselibrary.ie/east) as well as the New York Academy of Medicine guidelines on Grey Literature (http://www.hselibrary.ie/east). Grey Literature and Online sources searched:

Name	Note
GoogleScholar http://scholar.google.com/	Extensive range of articles in a range of related subject areas. Many Open Access articles and specialist articles are available.
OpenGrey(http://www.opengrey.eu)	Resource for information on Grey Literature in Europe
NLM (National Library of Medicine, US) (http://www.ncbi.nlm.nih.gov) • NLM Databases: http://www.nlm.nih.gov/nichsr/db.html **NLM Library Catalogue:** • http://locatorplus.gov/	*Databases Indexed:* Health Services Research Projects in Progress (HSRProj) Health Services and Sciences Research Resources (HSRR) Health Services/Technology Assessments Texts (HSTAT)

Institutional repositories: • **OpenDOAR** (http://www.opendoar.org/) • **Bielefeld Base** (http://www.base-search.net/Search/Advanced) • **Lenus** (http://www.lenus.ie/hse/) • **RIAN** (http://rian.ie/) • **e-publications@RCSI** (http://epubs.rcsi.ie/)	Digital collections of scholarly output from: • academic and professional organisations • International • European • Irish – HSE • Irish – academic • RCSI
Social Science Research Network (http://ssrn.com/)	Number of specialized research networks in each of the social sciences. Includes an abstracts database of forthcoming papers and working papers as well as Electronic Paper Collection of full text documents. Good for health service topics.
Websites of relevant professional organisations	Irish Nurses and Midwives Organisation https://www.inmo.ie/ *Royal College of Nursing* https://www.rcn.org.uk/ *American Nurses Association* http://nursingworld.org/

Search Strings

The development of search strings included MESH terms, subject headings and keywords as an essential part of the overall searching methodology. The inputting of terms was matched via various algorithms to content of databases and other online resources. The goal was to be broad enough in scope to match the largest range of articles but narrow and focussed enough to capture the most relevant results.

Imposed Limits

In the initial search there were no limits on the time frame of publication, format or languages as the search was intended to be as broad and as inclusive as possible ensuring the capture of all relevant evidence. The scope for the review was international and national so no geographical limits existed. A defined time limit of post 2009 was included to ensure capture of all literature since the last Wound Management guidelines were published.

Data synthesis

Data synthesis was undertaken and a narrative summary of the data was provided to each work stream (Moore and Cowman, 2008).

Appendix XIX: Copyright/Permissions Sought

Below is a list of organisations/authors who were contacted to seek permission to re-produce and/or include content within this guideline.

- Australian Wound Management Association (AWMA) and the New Zealand Wound Care Society (NZWCS)
- European Oncology Nursing Society (EONS)
- International Working Group Diabetic Foot (IWGDF)
- McNichol and Bianchi (2016)- " Marsi Made Easy"
- National Institute For Health and Clinical Excellence (NICE)
- National Pressure Ulcer Advisory Panel (NPUAP) European Pressure Ulcer Advisory Panel (EPUAP) and Pan Pacific Pressure Injury Alliance (PPPIA)
- NHS Healthcare Improvement Scotland
- Scottish Intercollegiate Guideline Network (SIGN)
- Society for Vascular Surgery and the American Venous Forum (SVASF)
- The Association for Safe Aseptic Practice (Aseptic Non-Touch Technique® - ANTT®)
- The European Society for Vascular Surgery (ESVS)
- Winnipeg Regional Health Authority (WRHA)
- World Health Organisations (WHO)
- Wounds International

Appendix XX: Approved Policies, Procedures, Protocols and Guidelines Checklist

Title: HSE National Wound Management Guidelines 2018

Standards for developing Clinical PPPG	Checklist
Stage 1 Initiation	
The decision making approach relating to the type of PPPG guidance required (policy, procedure, protocol, guideline), coverage of the PPPG (national, regional, local) and applicable settings are described.	√
Synergies/co-operations are maximised across departments/organisations (Hospitals/Hospital Groups/Community Healthcare Organisations (CHO)/National Ambulance Service (NAS)), to avoid duplication and to optimise value for money and use of staff time and expertise.	√
The scope of the PPPG is clearly described, specifying what is included and what lies outside the scope of the PPPG.	√
The target users and the population/patient group to whom the PPPG is meant to apply are specifically described.	√
The views and preferences of the target population have been sought and taken into consideration (as required).	√
The overall objective(s) of the PPPGs are specifically described.	√
The potential for improved health is described (e.g. clinical effectiveness, patient safety, quality improvement, health outcomes, quality of life, quality of care).	√
Stakeholder identification and involvement: The PPPG Development Group includes individuals from all relevant stakeholders, staff and professional groups.	√
Conflict of interest statements from all members of the PPPG Development Group are documented, with a description of mitigating actions if relevant.	√
The PPPG is informed by the identified needs and priorities of service users and stakeholders.	√
There is service user/lay representation on PPPG Development Group (as required).	√
Information and support is available for staff on the development of evidence-based clinical practice guidance.	√

Stage 2 Development	Checklist
The clinical question(s) covered by the PPPG are specifically described.	√
Systematic methods used to search for evidence are documented (for PPPGs which are adapted/adopted from international guidance, their methodology is appraised and documented).	√
Critical appraisal/analysis of evidence using validated tools is documented (the strengths, limitations and methodological quality of the body of evidence are clearly described).	√
The health benefits, side effects and risks have been considered and documented in formulating the PPPG.	√
There is an explicit link between the PPPG and the supporting evidence.	√
PPPG guidance/recommendations are specific and unambiguous.	√

The potential resource implications of developing and implementing the PPPG are identified e.g. equipment, education/training, staff time and research.	√
There is collaboration across all stakeholders in the planning and implementation phases to optimise patient flow and integrated care.	√
Budget impact is documented (resources required).	√
Education and training is provided for staff on the development and implementation of evidence-based clinical practice guidance (as appropriate).	√
Three additional standards are applicable for a small number of more complex PPPGs: Cost effectiveness analysis is documented. A systematic literature review has been undertaken. Health Technology Assessment (HTA) has been undertaken.	Not deemed necessary √ Not under taken

Stage 3 Governance and Approval	Checklist
Formal governance arrangements for PPPGs at local, regional and national level are established and documented.	√
The PPPG has been reviewed by independent experts prior to publication (as required).	√
Copyright and permissions are sought and documented.	√

Stage 4 Communication and Dissemination	Checklist
A communication plan is developed to ensure effective communication and collaboration with all stakeholders throughout all stages.	√
Plan and procedure for dissemination of the PPPG is described.	√
The PPPG is easily accessible by all users e.g. PPPG repository.	√

Stage 5 Implementation	Checklist
Written implementation plan is provided with timelines, identification of responsible persons/units and integration into service planning process.	√
Barriers and facilitators for implementation are identified, and aligned with implementation levers.	√
Education and training is provided for staff on the development and implementation of evidence-based PPPG (as required).	√
There is collaboration across all stakeholders in the planning and implementation phases to optimise patient flow and integrated care.	√

Stage 6 Monitoring, Audit, Evaluation	Checklist
Process for monitoring and continuous improvement is documented.	√
Audit criteria and audit process/plan are specified.	√
Process for evaluation of implementation and (clinical) effectiveness is specified.	√

Stage 7 Revision/Update	Checklist
Documented process for revisions/updating and review, including timeframe is provided.	√
Documented process for version control is provided.	√

I confirm that the above Standards have been met in developing the HSE National Wound Management Guidelines 2018
Name of Person(s) signing off on the PPPG Checklist:

Name: Maureen Nolan Title: Director of Nursing, National Lead for the Implementation and Audit of Nurse Prescribing of Ionising Radiation and Medicinal Prescribing Dublin Mid Leinster. ONMSD.	Signature: Maureen Nolan Date: May 24th 2018

Appendix XXI: Signature Sheet

Signature Sheet

I have read, understand and agree to adhere to this Policy, Procedure, Protocol or Guideline:

Print Name	Signature	Area of Work	Date

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The Office of Nursing and Midwifery Services Director,
Clinical Strategy and Programmes Division,
Dr Steevens' Hospital,
Dublin 8

telephone: +353 1 635 2471
e-mail: nursing.services@hse.ie

www.hse.ie

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Clinical Strategy and Programmes Division

Office of the
Nursing & Midwifery
Services Director